

FIG. 1 (a)

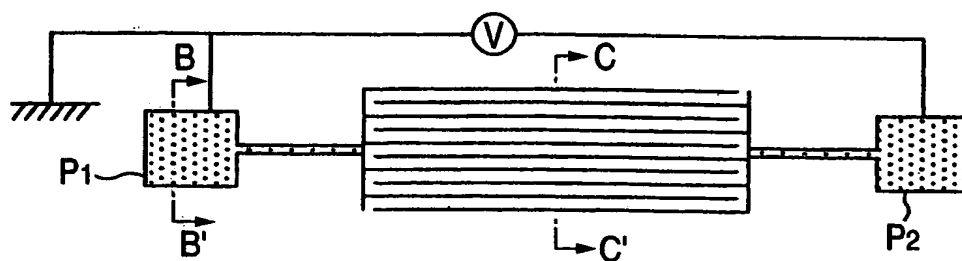


FIG. 1 (b)

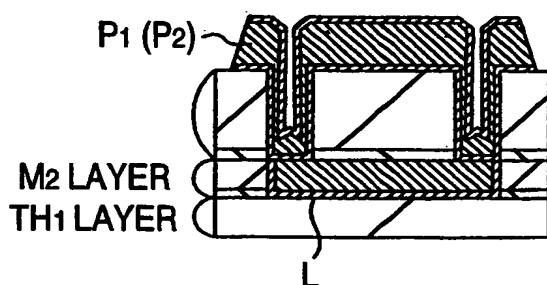


FIG. 1 (c)

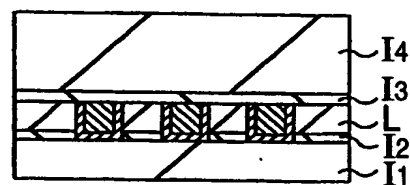


FIG. 2

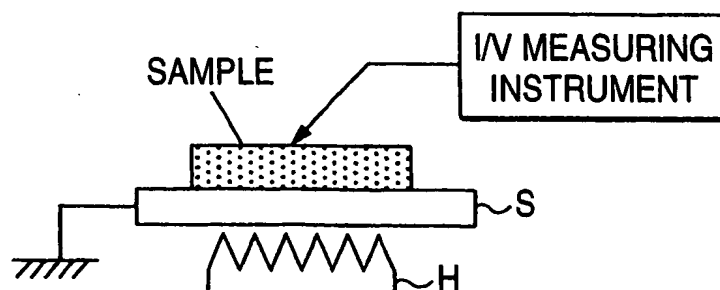


FIG. 3

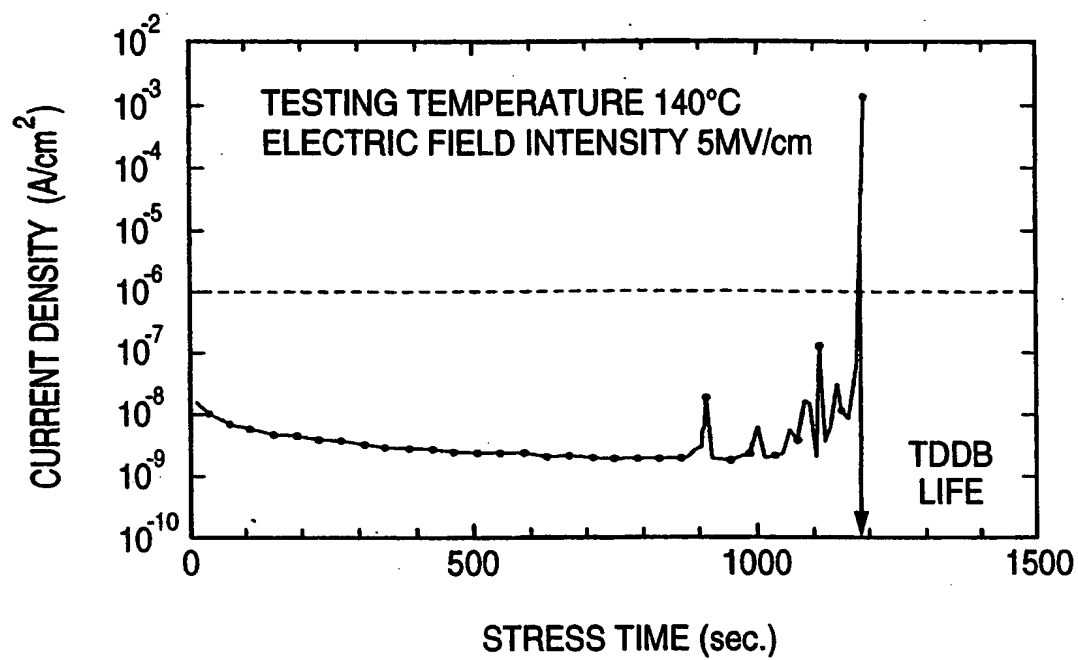
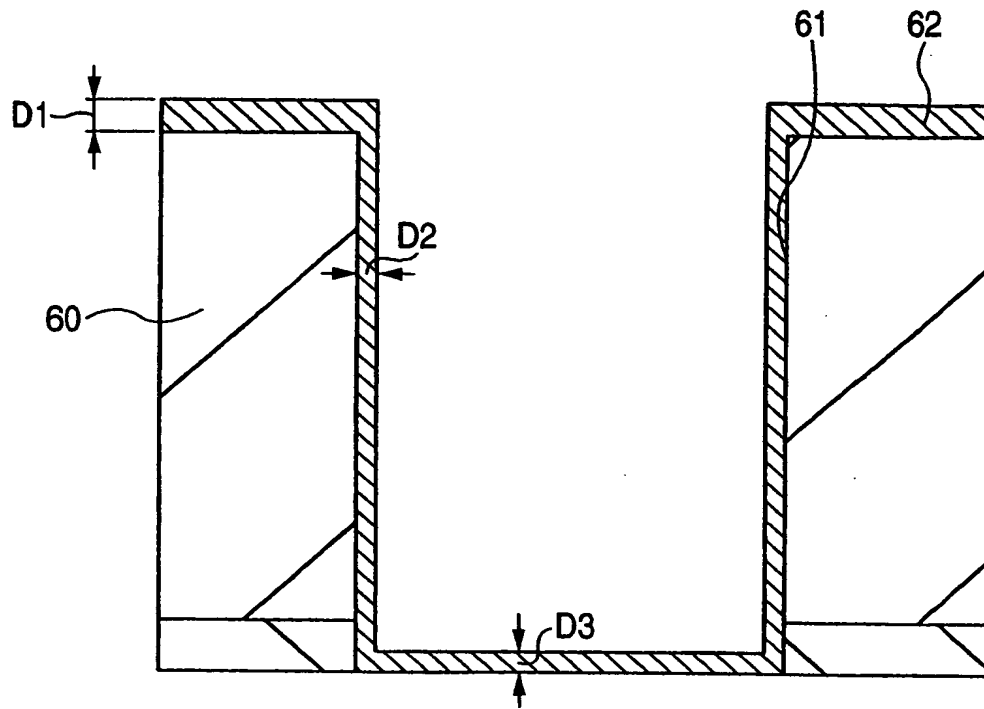


FIG. 4



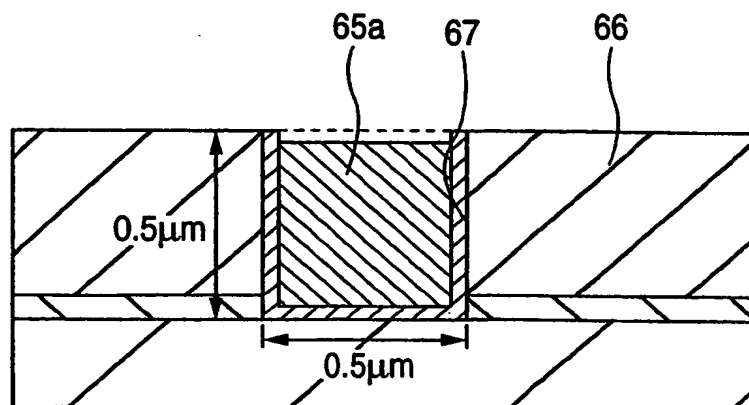
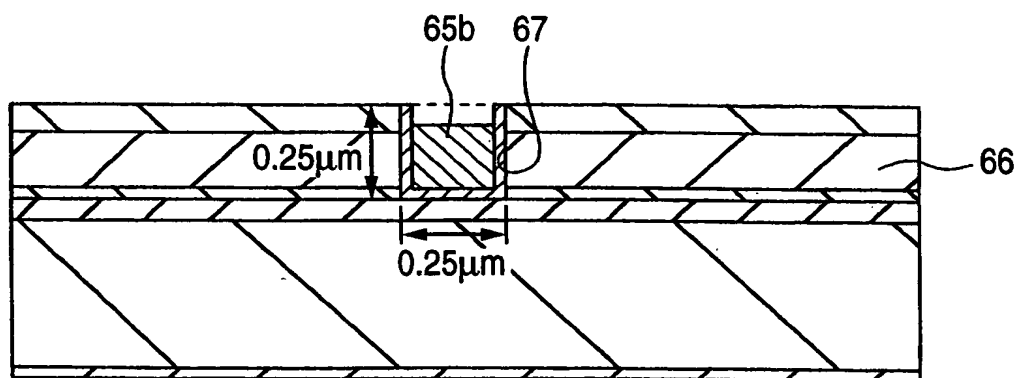
*FIG. 5 (a)**FIG. 5 (b)*

FIG. 6

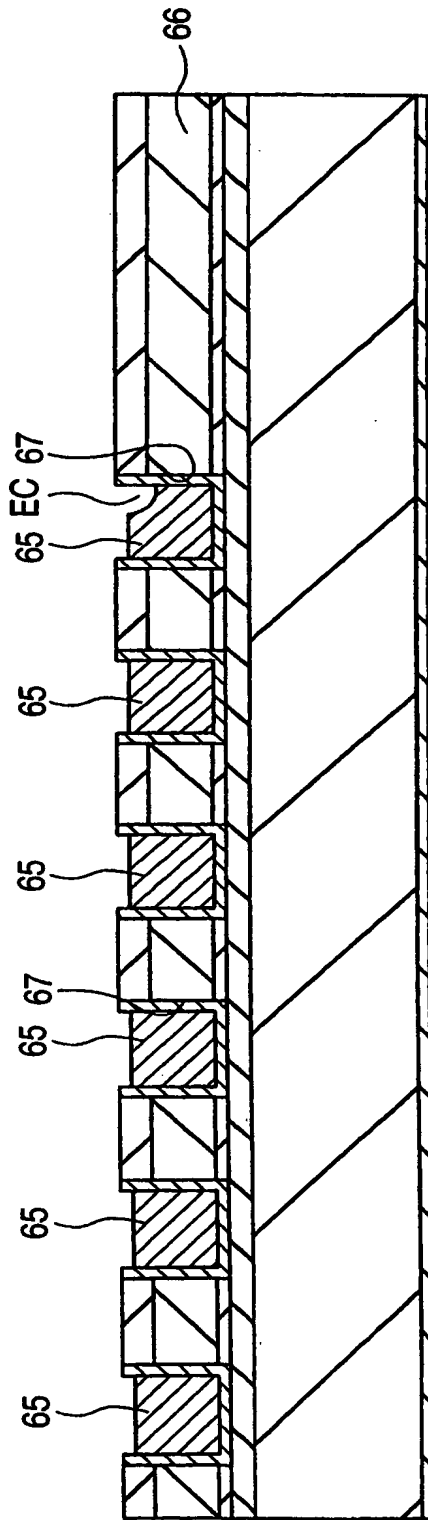


FIG. 7

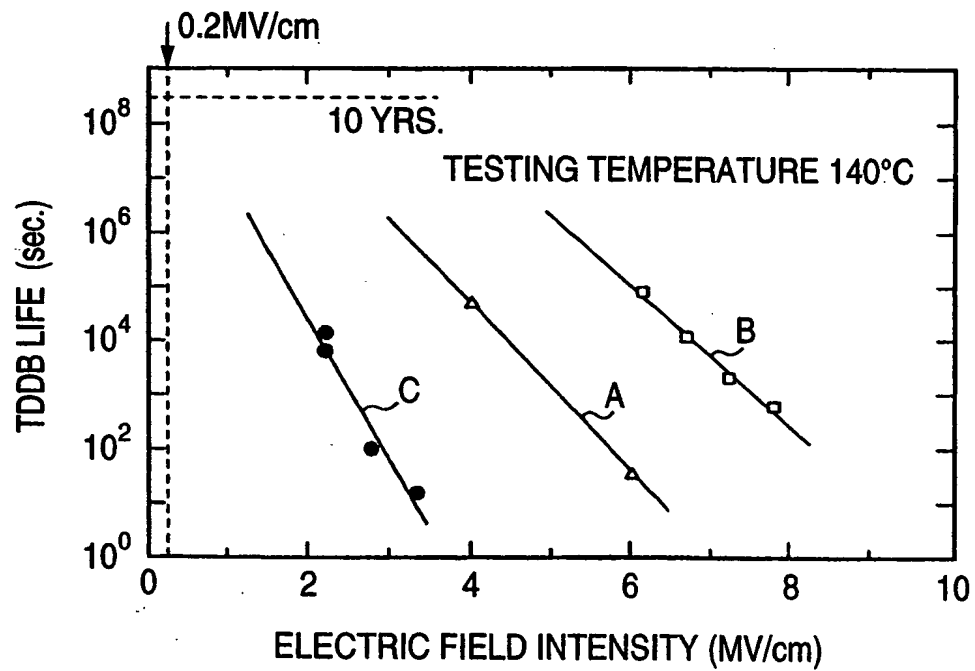


FIG. 8

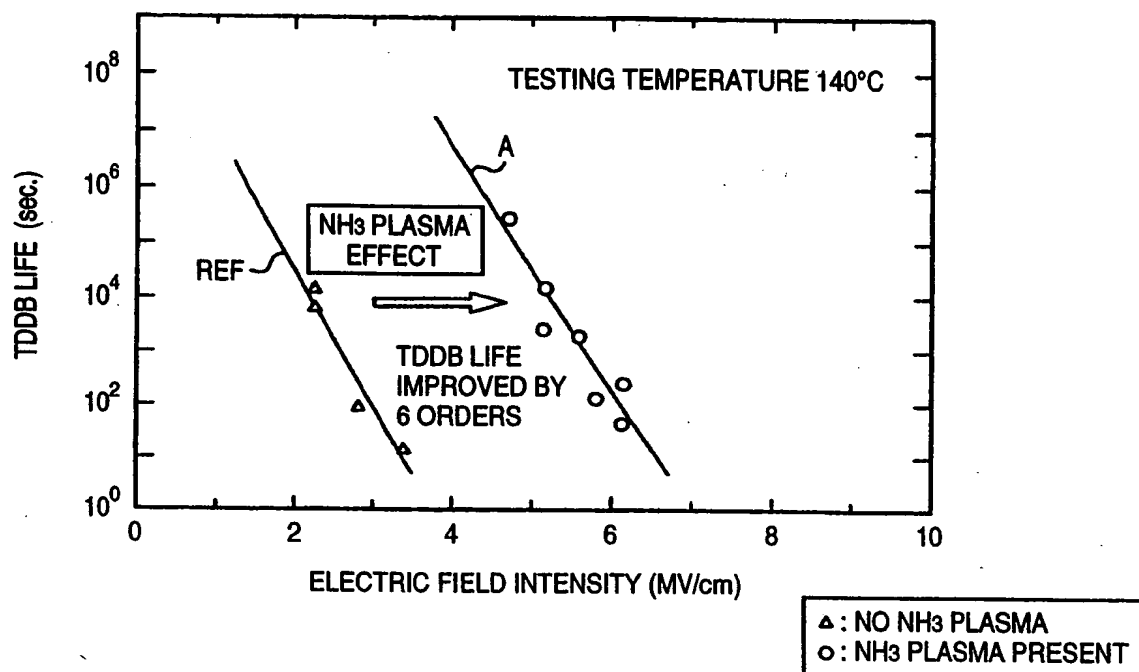


FIG. 9

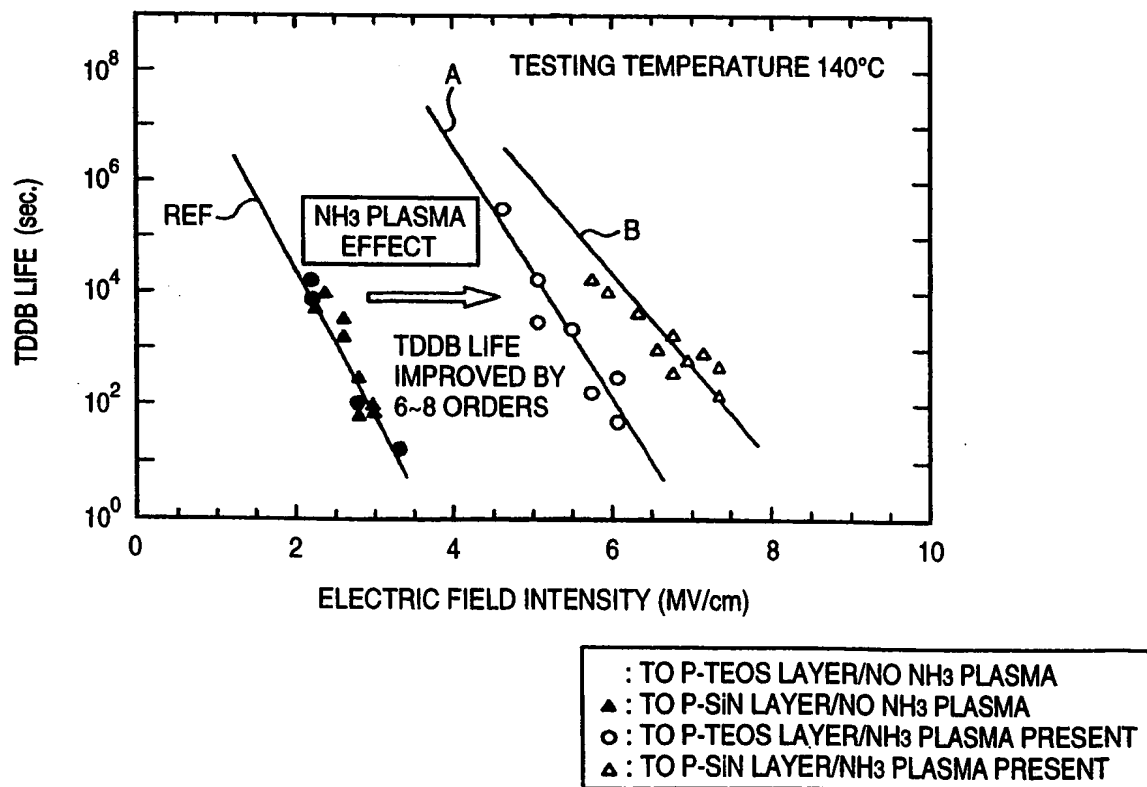


FIG. 10 (a)

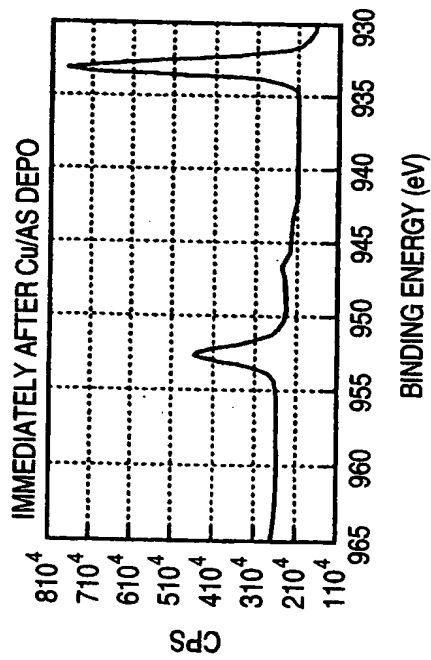


FIG. 10 (b)

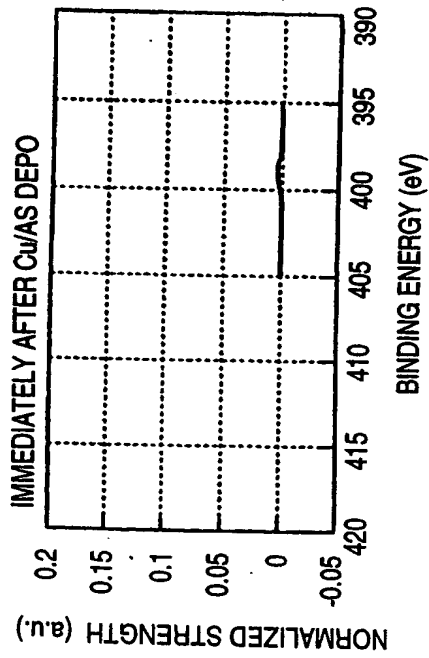


FIG. 10 (c)

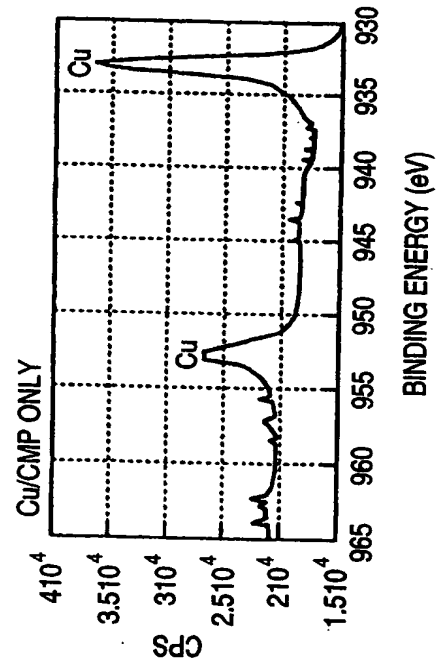


FIG. 10 (d)

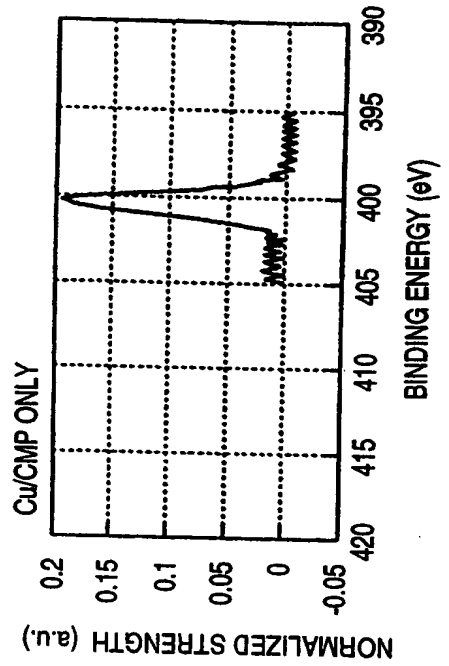




FIG. 11 (a)

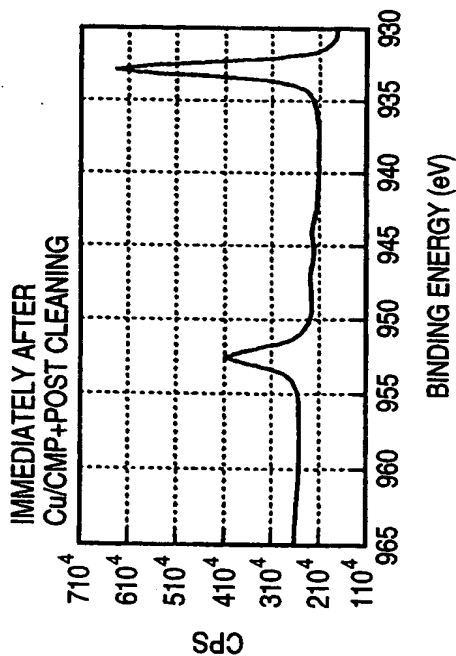


FIG. 11 (b)

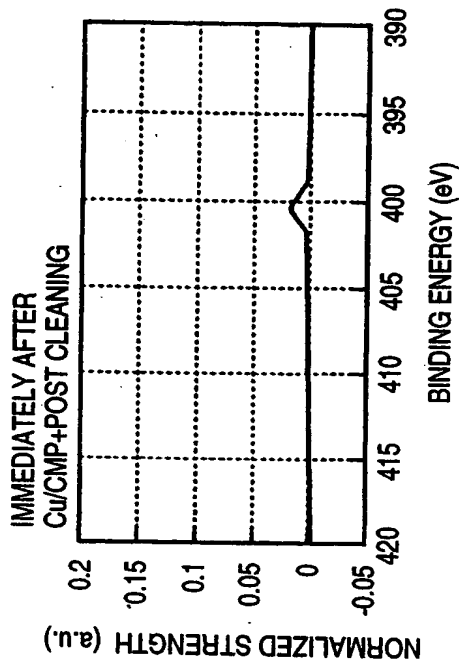


FIG. 11 (c)

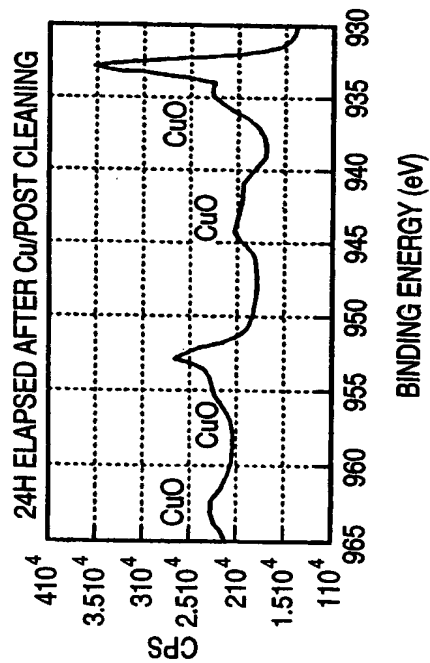


FIG. 11 (d)

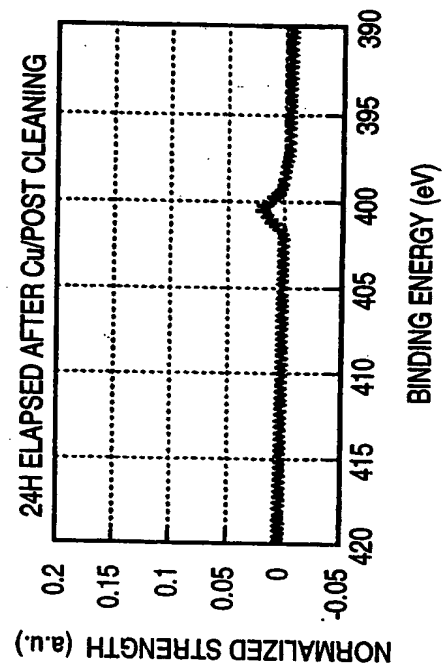


FIG. 12 (a)

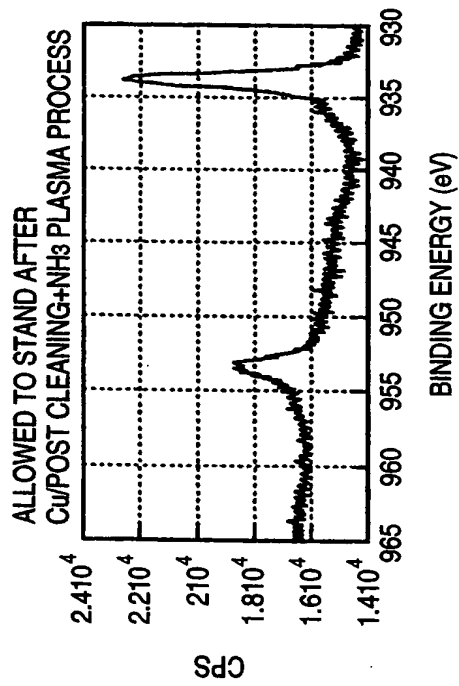


FIG. 12 (b)

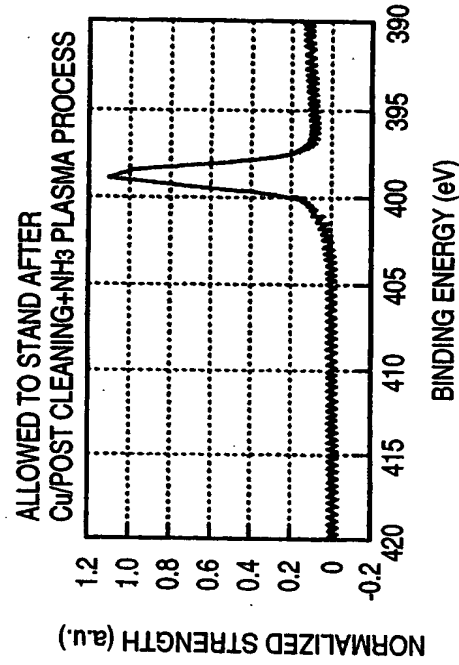


FIG. 12 (c)

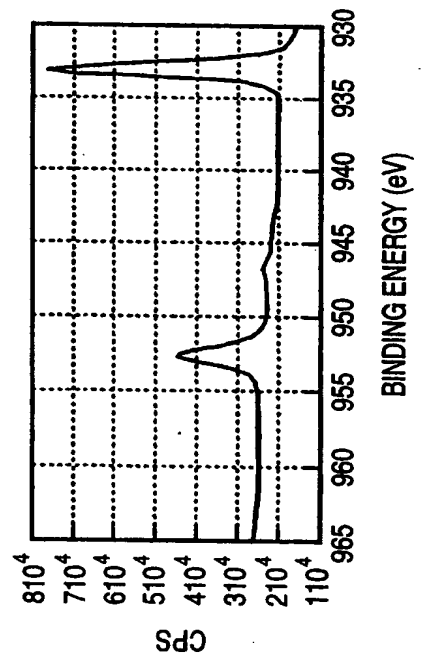


FIG. 12 (d)

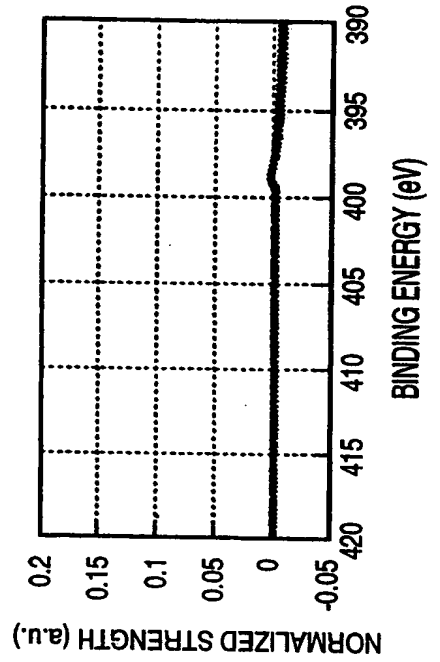


FIG. 13 (a)

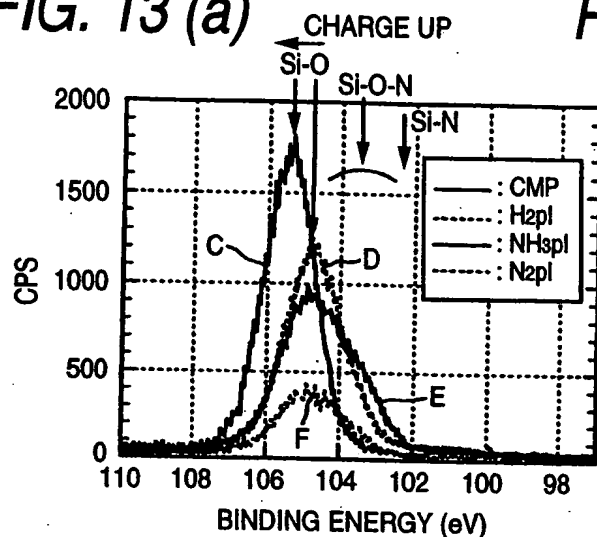


FIG. 13 (b)

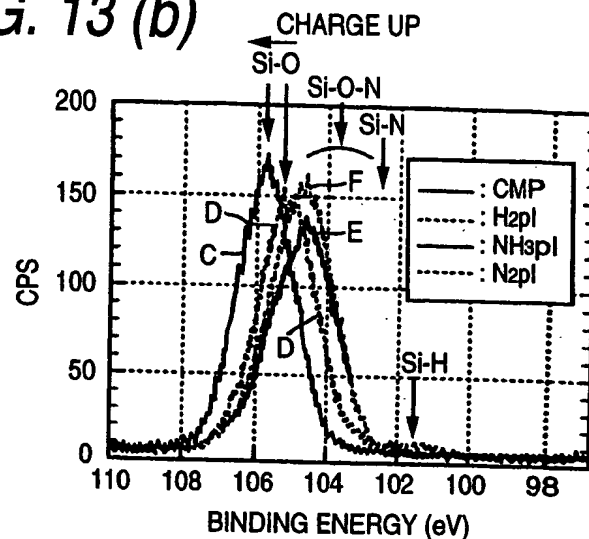


FIG. 13 (c)

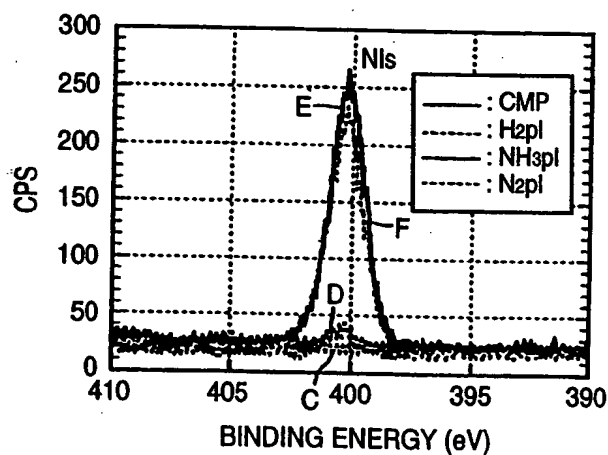


FIG. 13 (d)

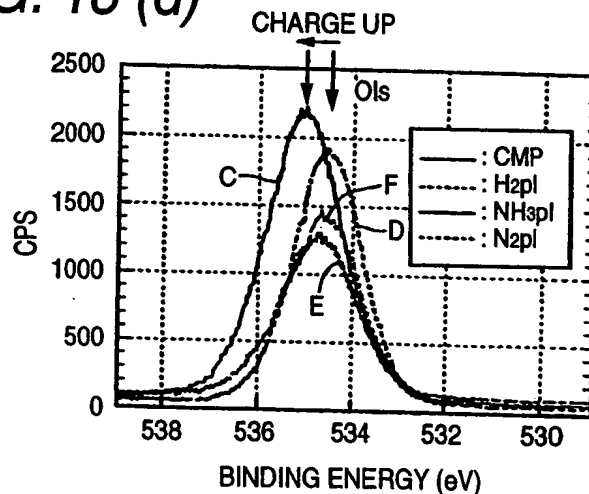


FIG. 13 (e)

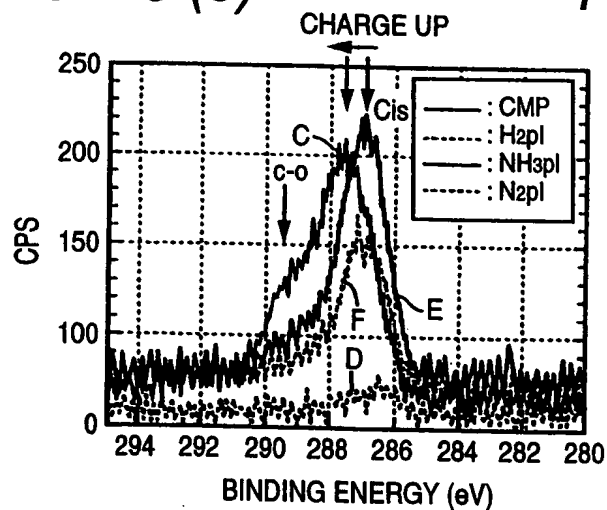


FIG. 13 (f)

CONDITION	Si <sub>3</sub> N <sub>x</sub>
CMP	—
H <sub>2</sub> pl	Si <sub>3</sub> N <sub>1.08</sub>
NH <sub>3</sub> pl	Si <sub>3</sub> N <sub>4.22</sub>
N <sub>2</sub> pl	Si <sub>3</sub> N <sub>3.81</sub>

FIG. 14 (a)

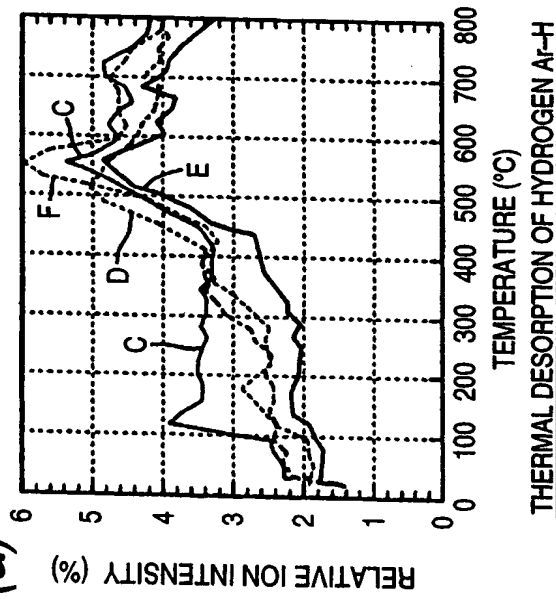


FIG. 14 (c)

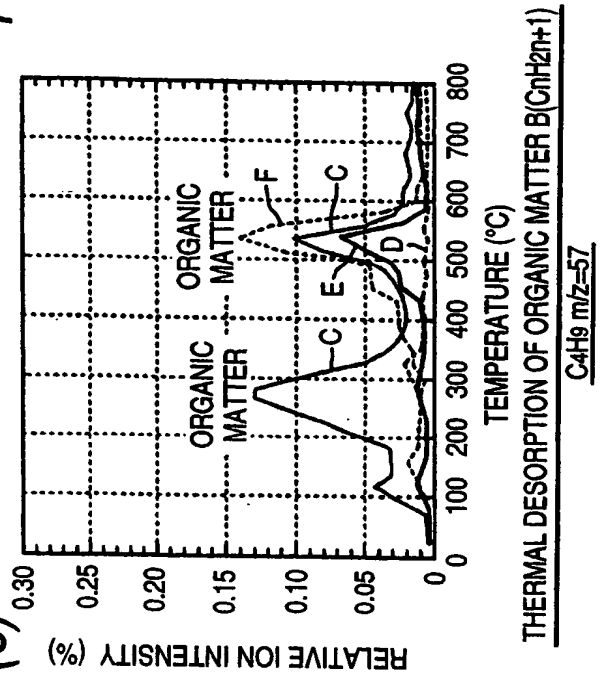


FIG. 14 (b)

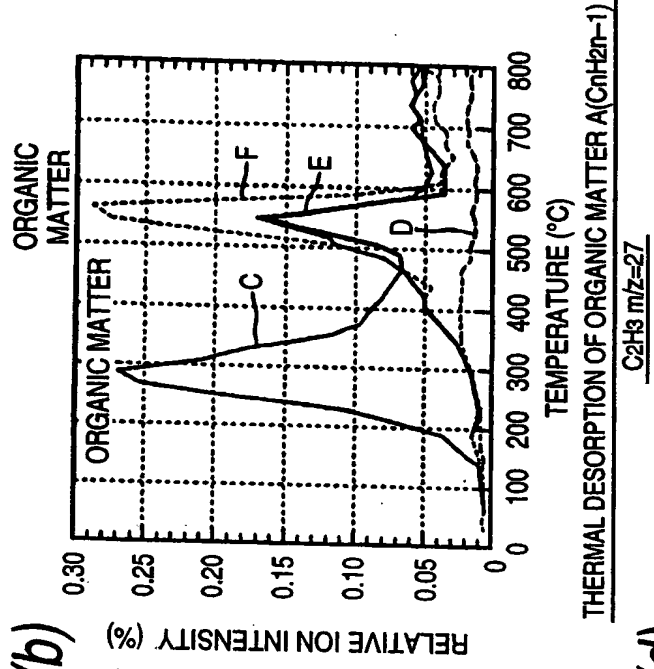


FIG. 14 (d)

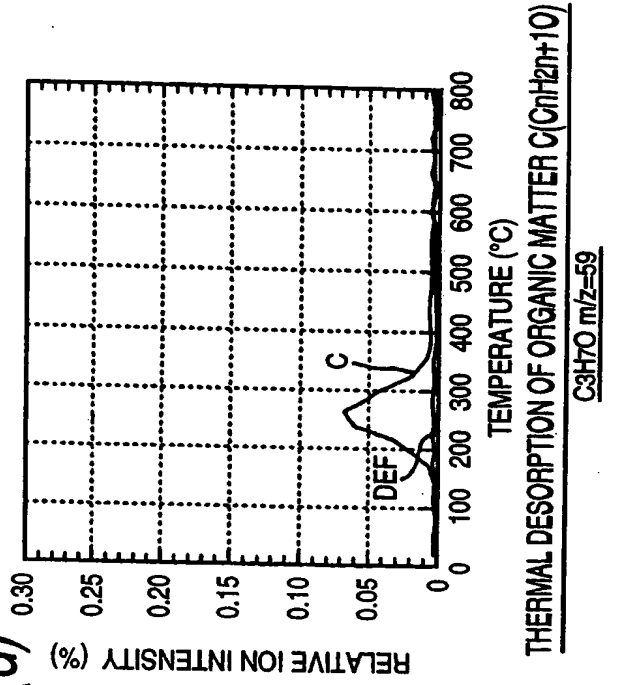


FIG. 15 (a)

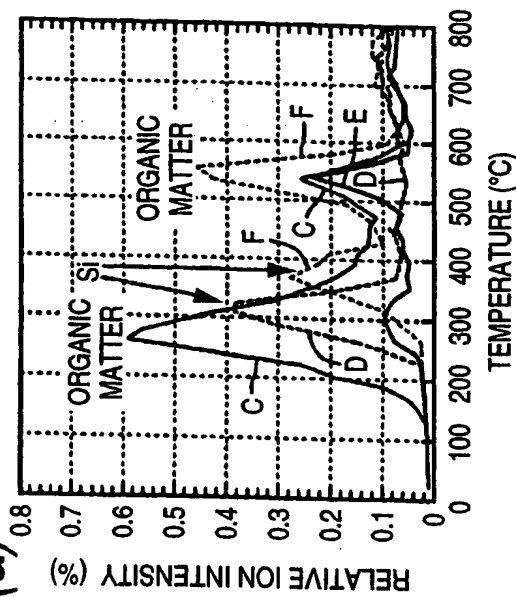


FIG. 15 (b)

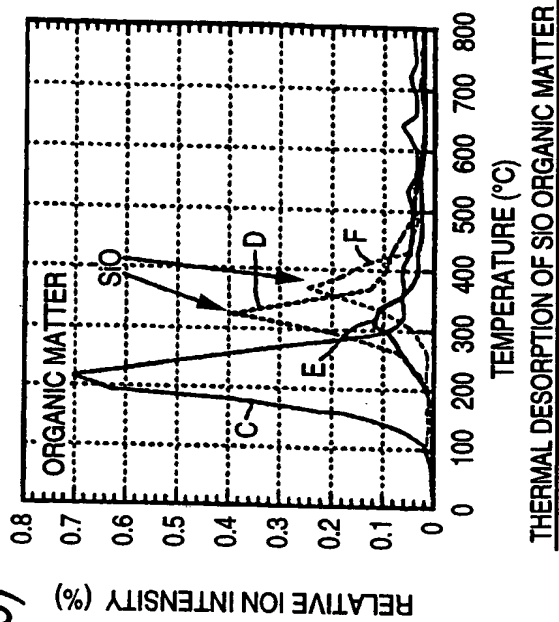


FIG. 15 (c)

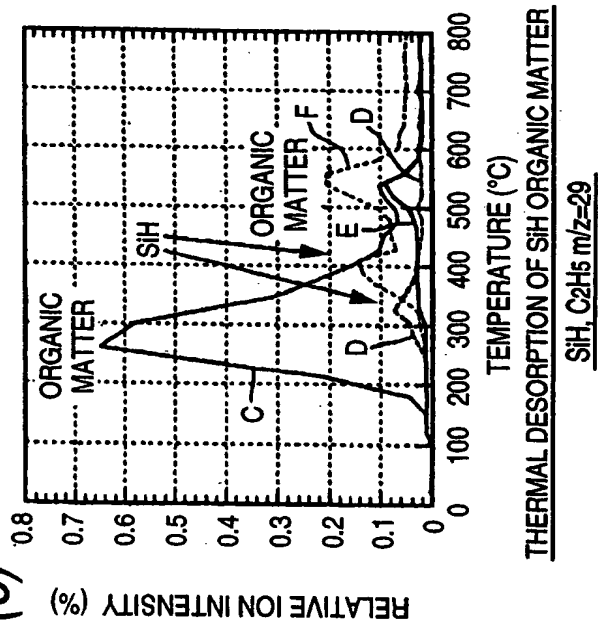


FIG. 15 (d)

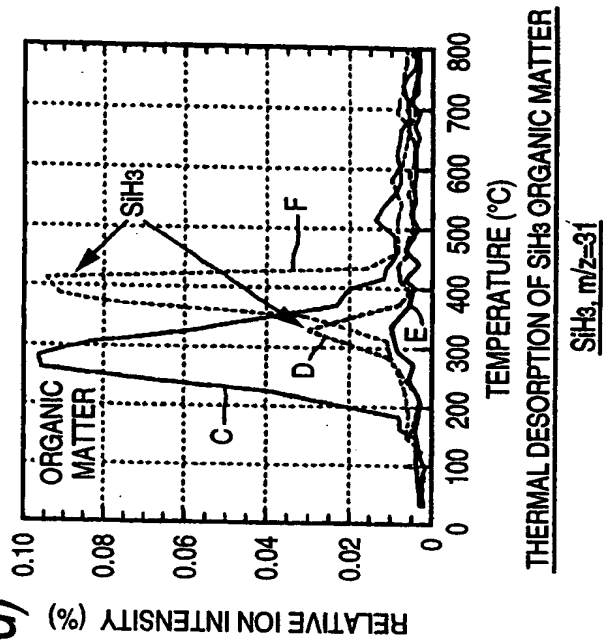
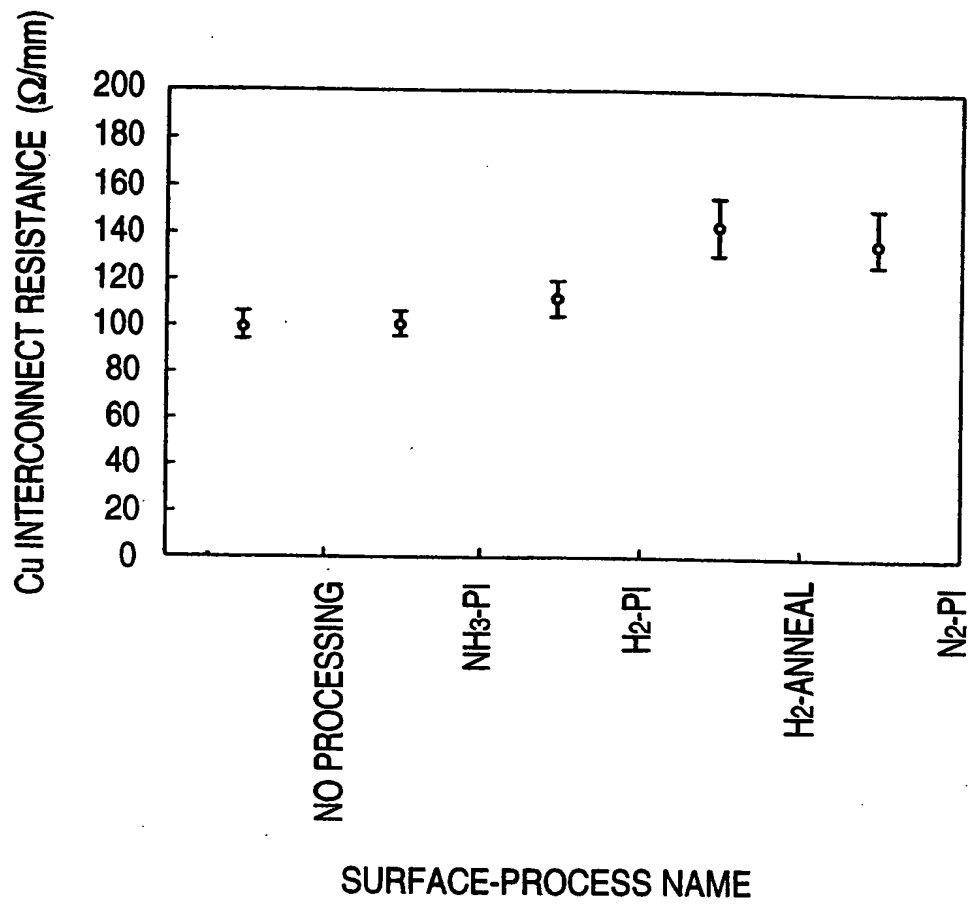


FIG. 16



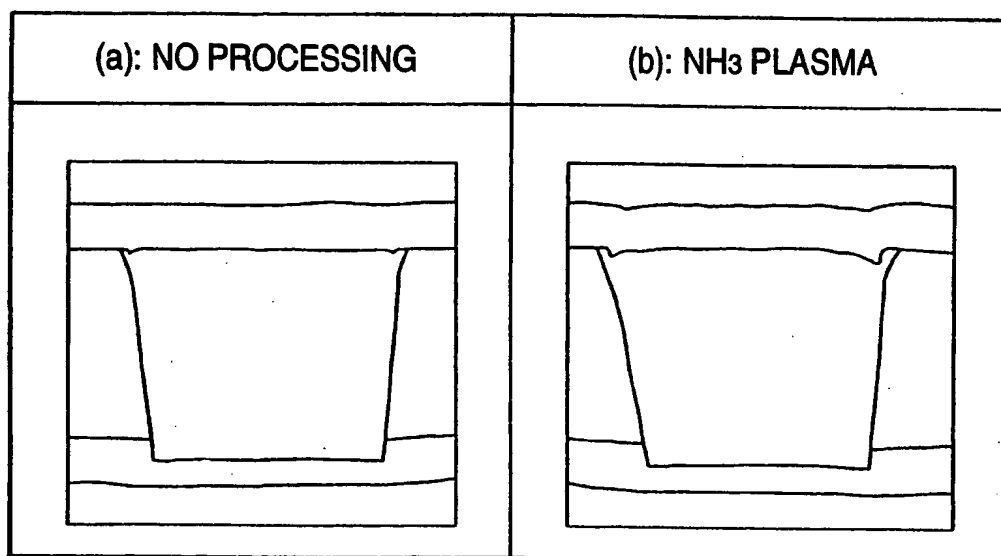
**FIG. 17**

FIG. 18

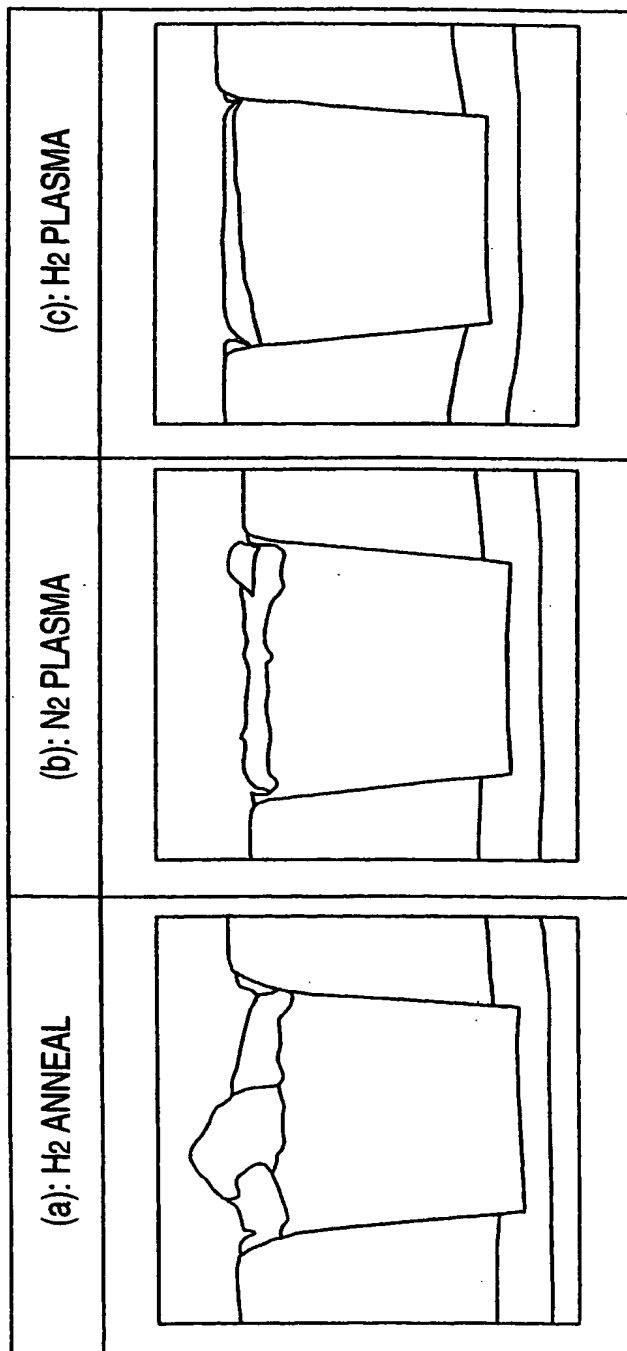




FIG. 19 (b)

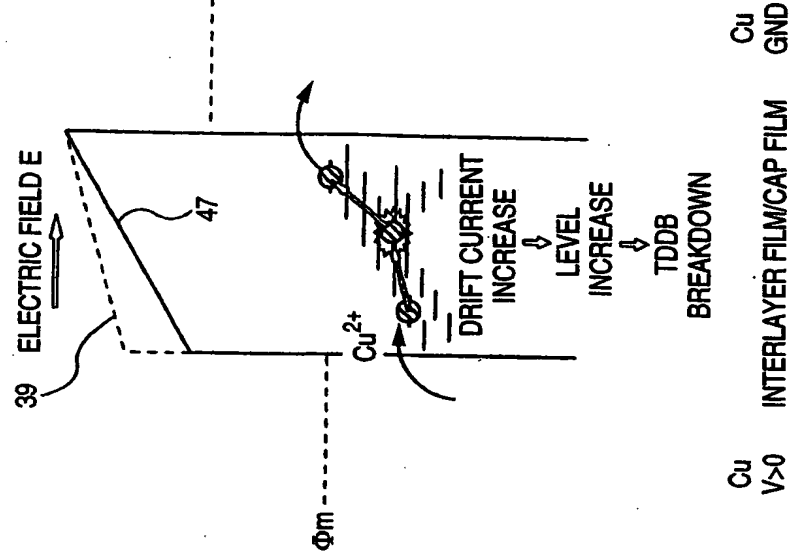


FIG. 19 (a)

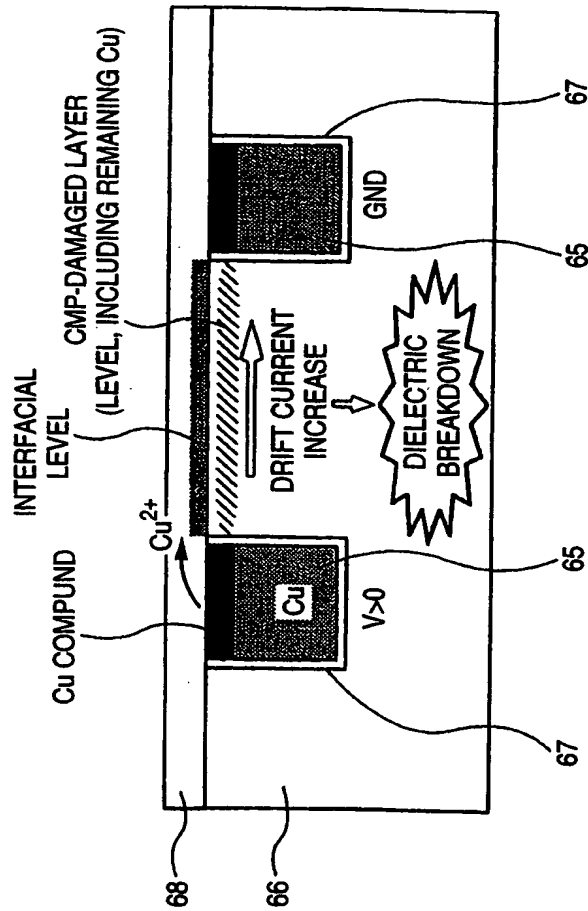


FIG. 20 (a)

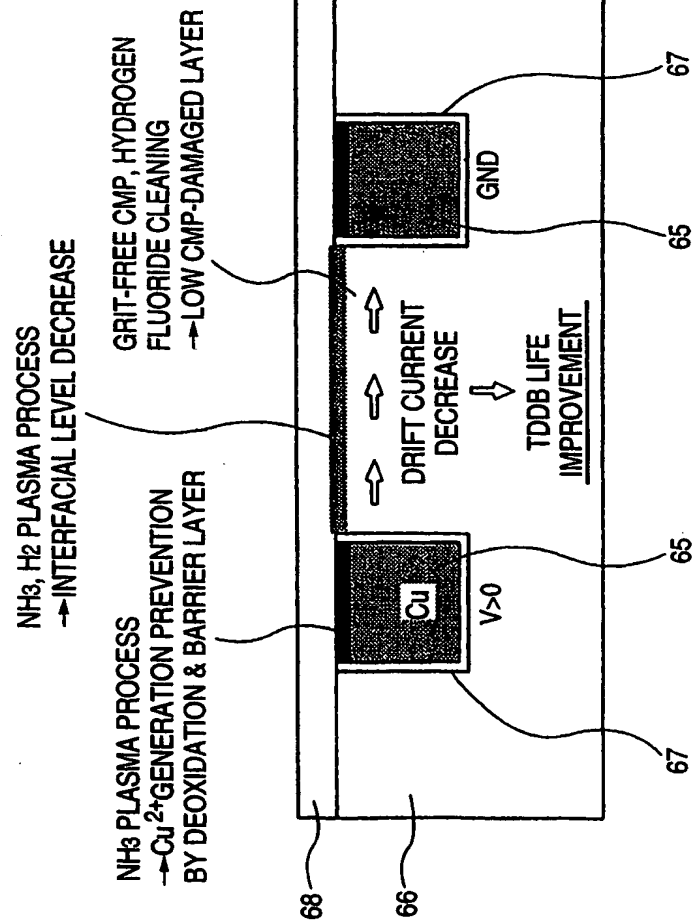
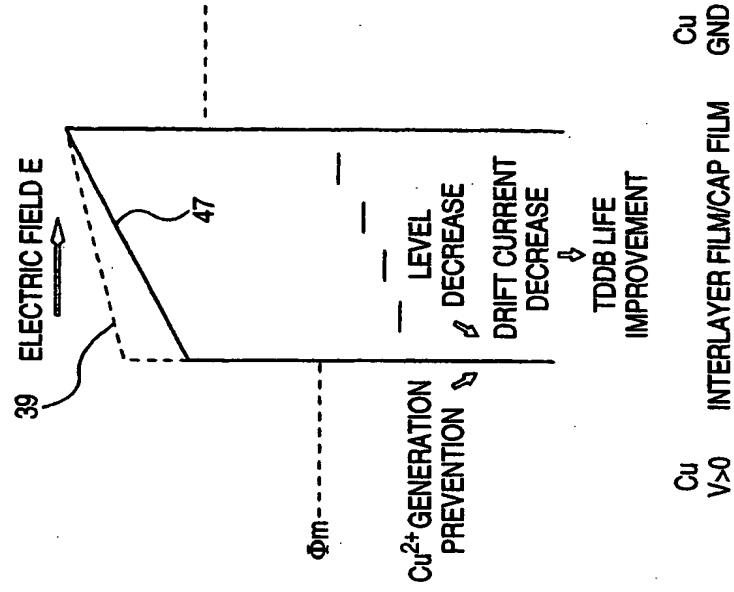
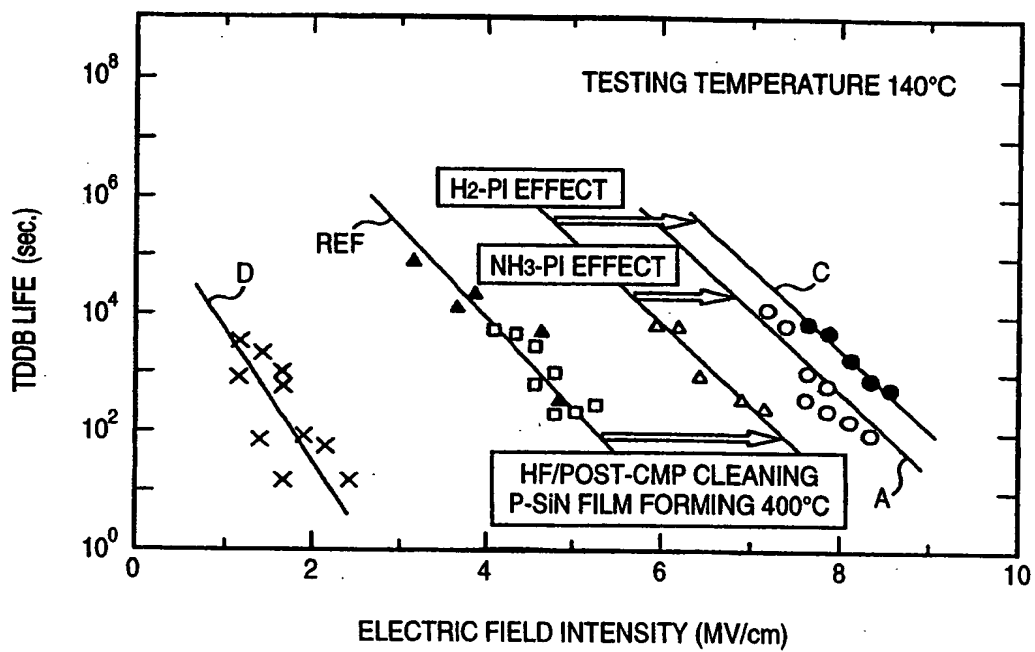


FIG. 20 (b)



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FIG. 21



- : NH<sub>3</sub>-PI
- : H<sub>2</sub>-PI
- × : N<sub>2</sub>-PI
- △ : NO PROCESSING
- : H<sub>2</sub>-ANNEAL
- ▲ : NO PROCESSING (360C, NO HF)

FIG. 22

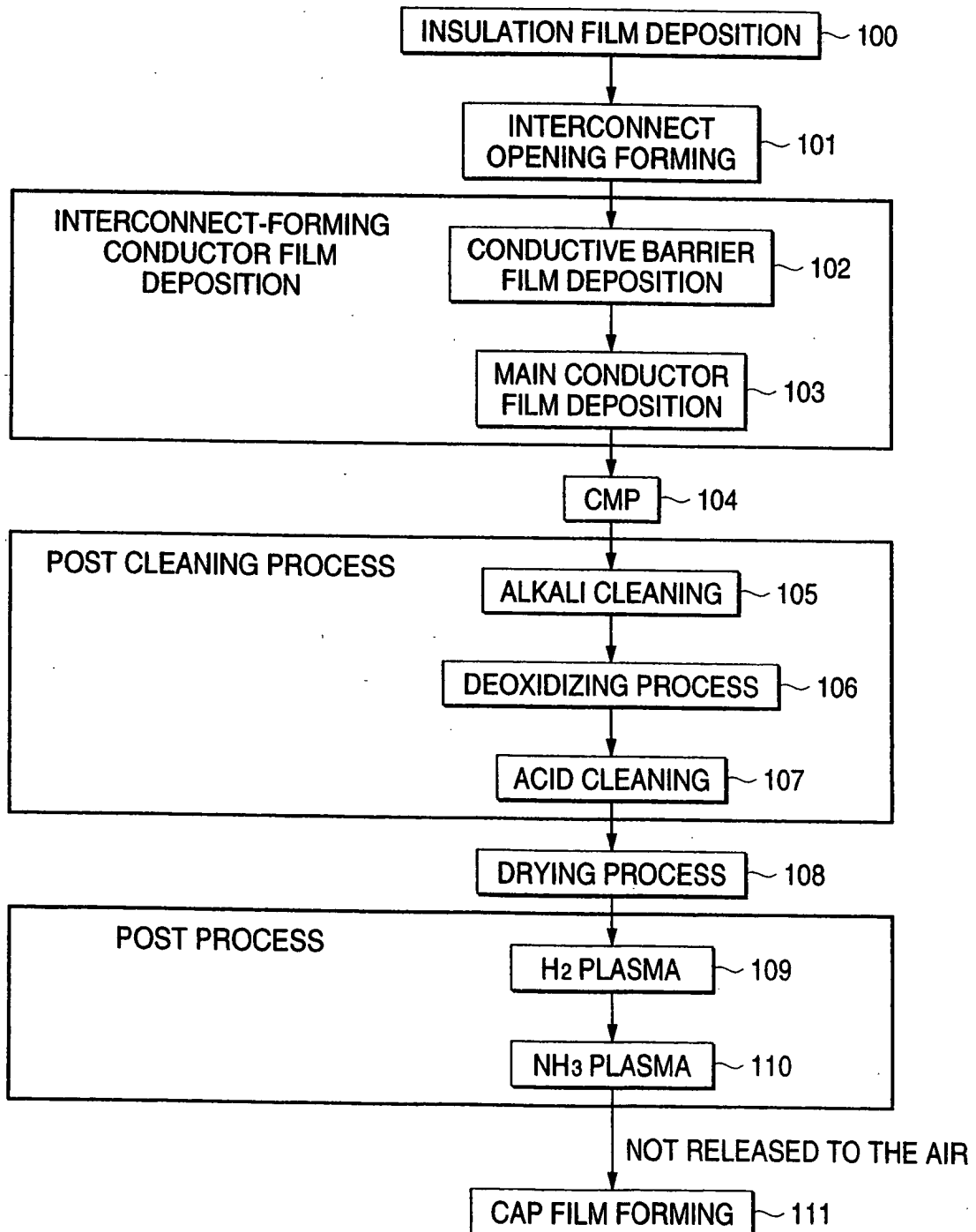


FIG. 23 (a)

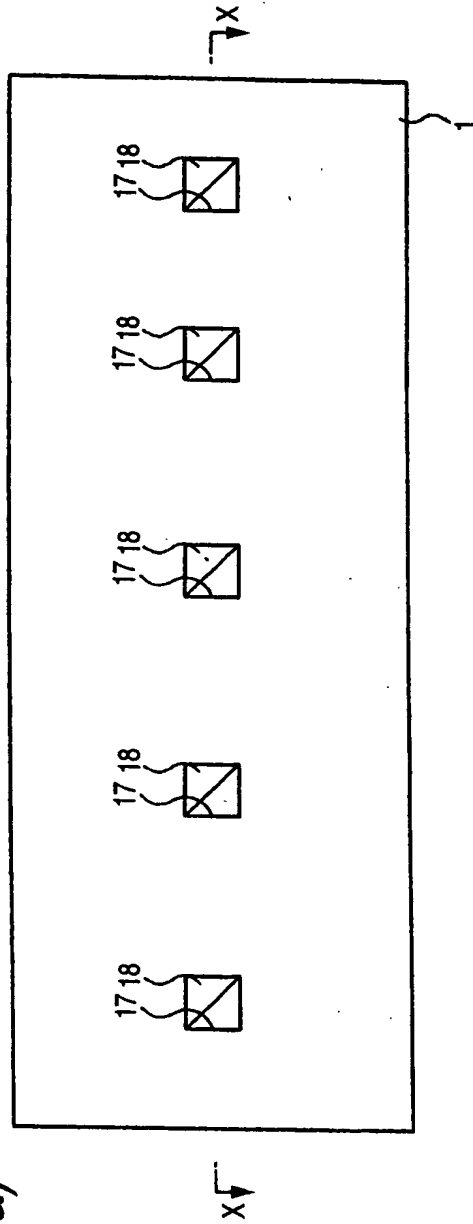


FIG. 23 (b)

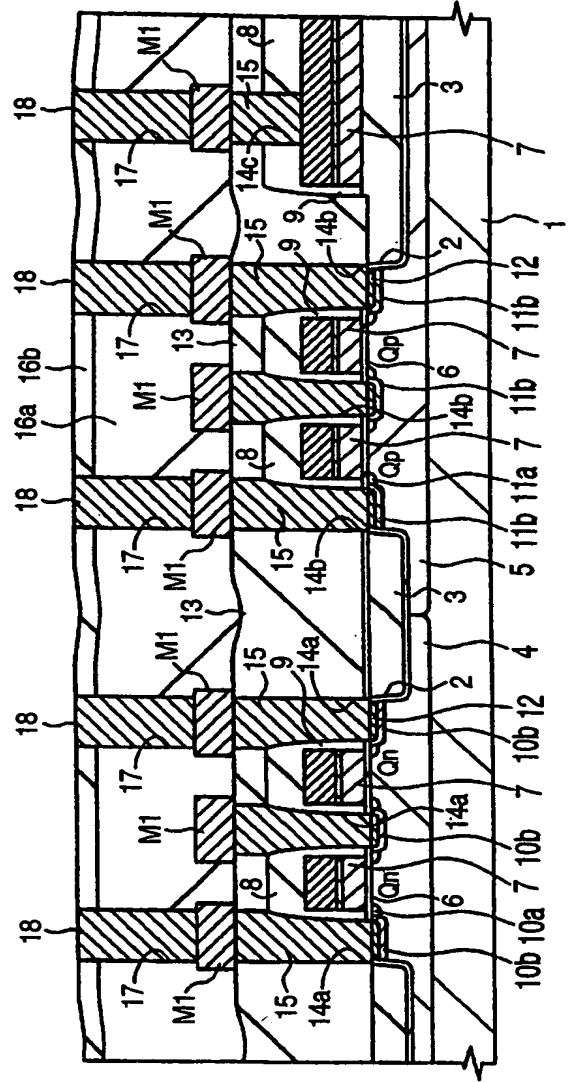


FIG. 24 (a)

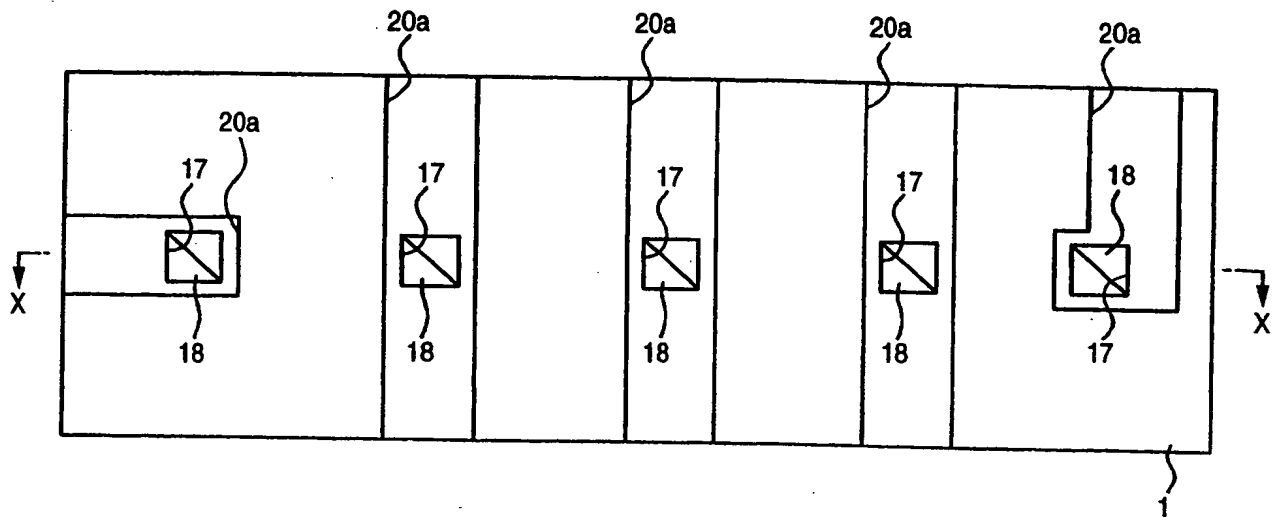


FIG. 24 (b)

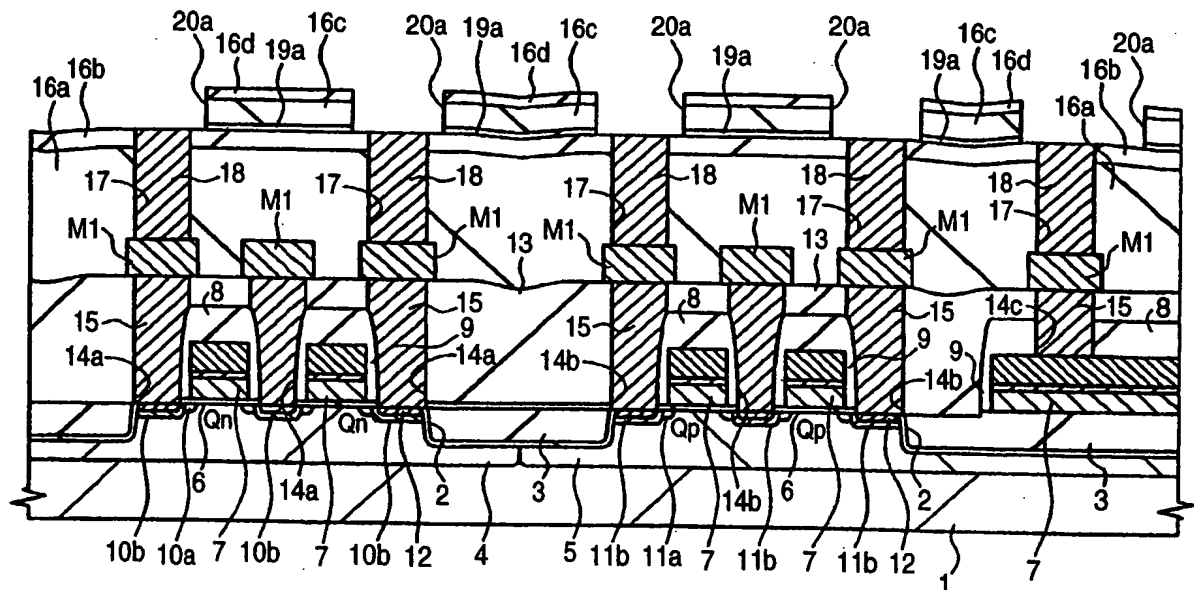
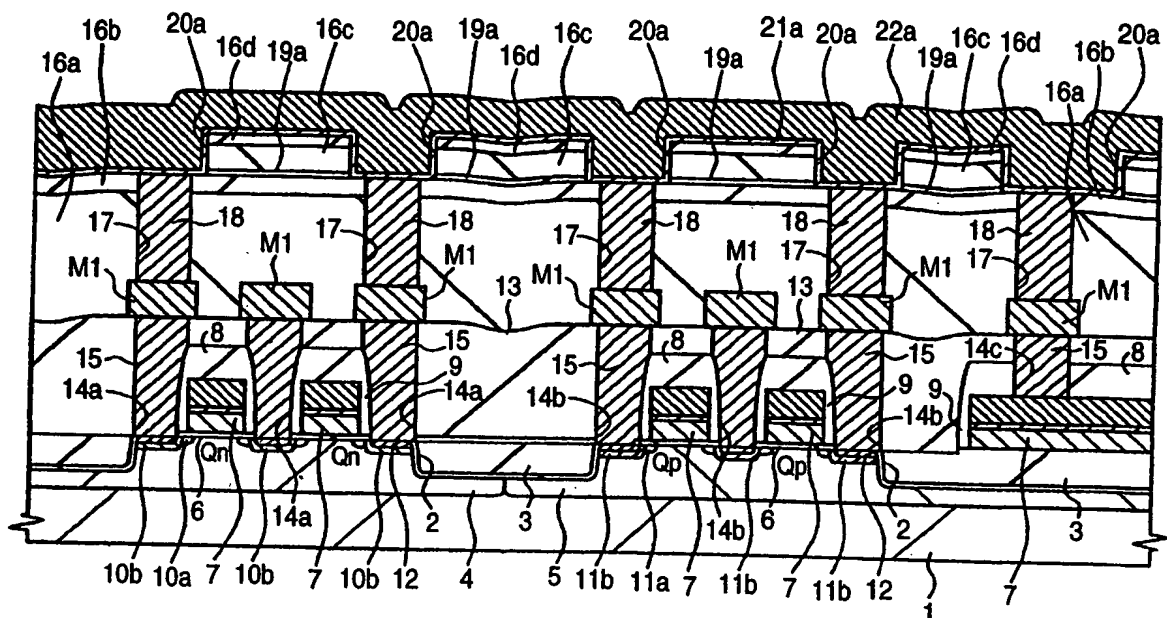


FIG. 25







**FIG. 27**

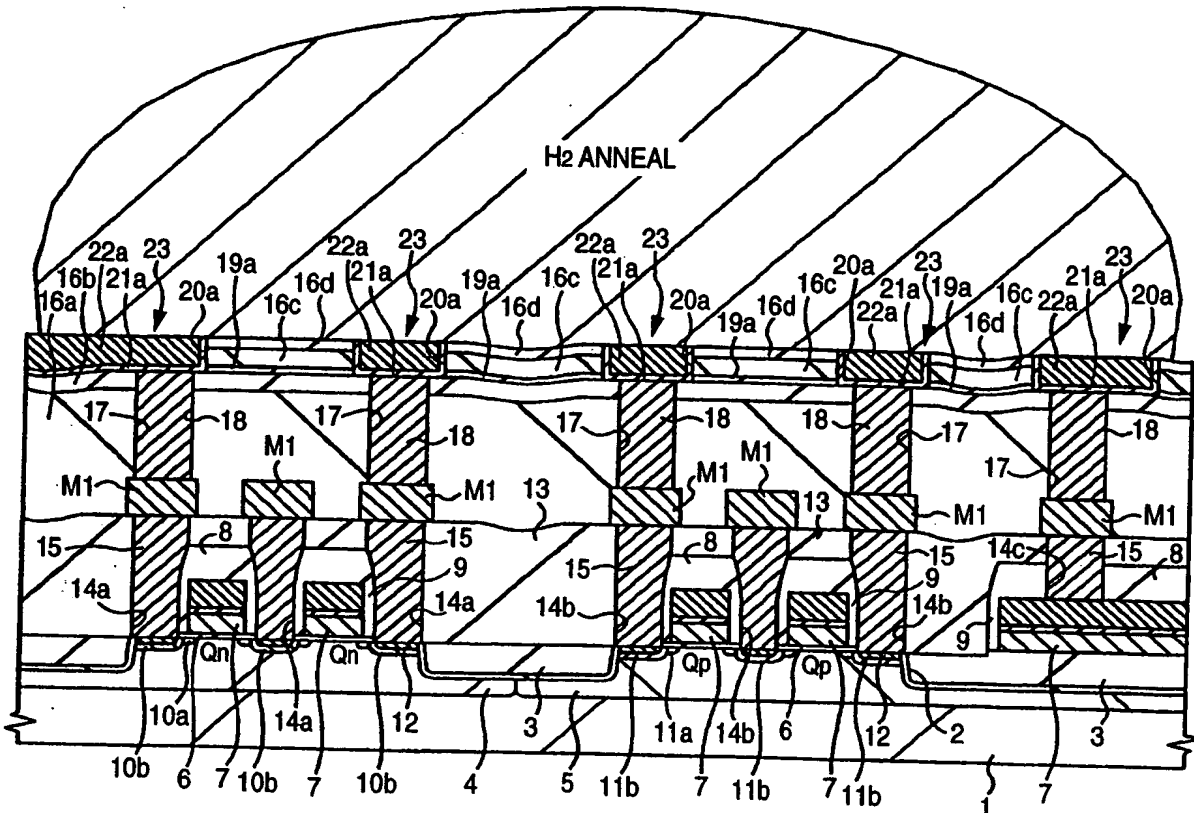


FIG. 28

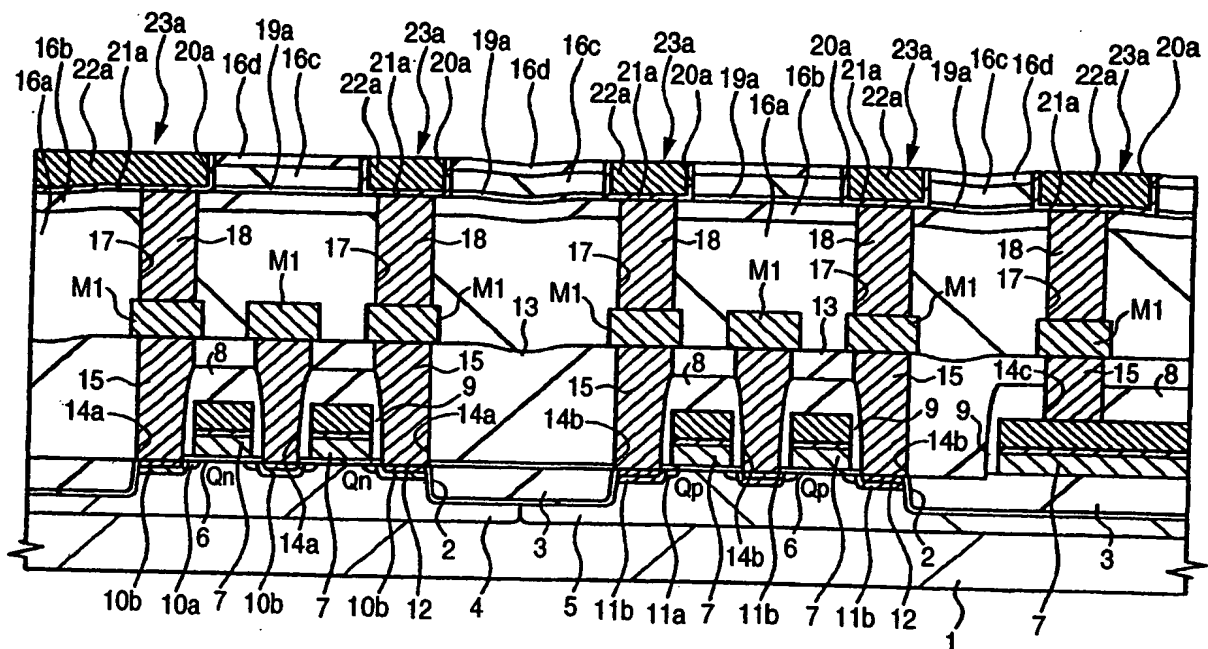
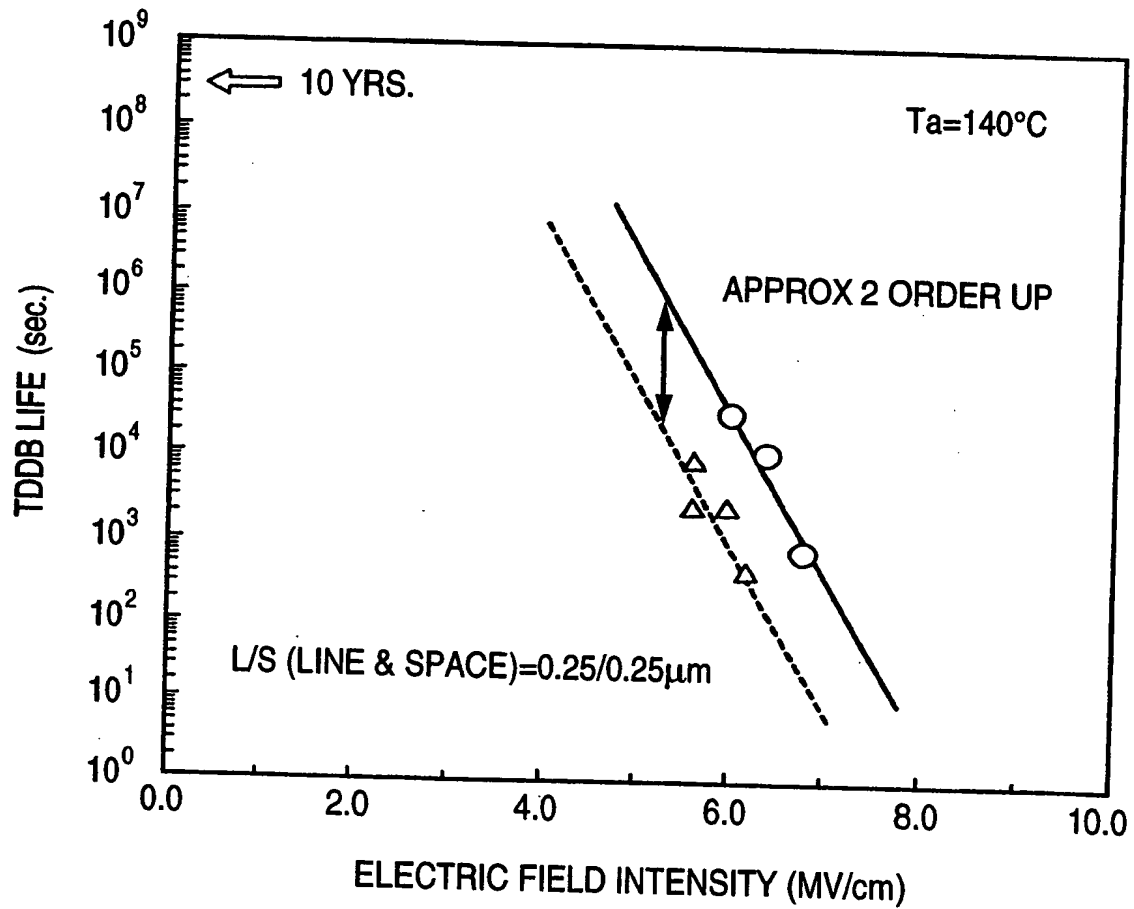
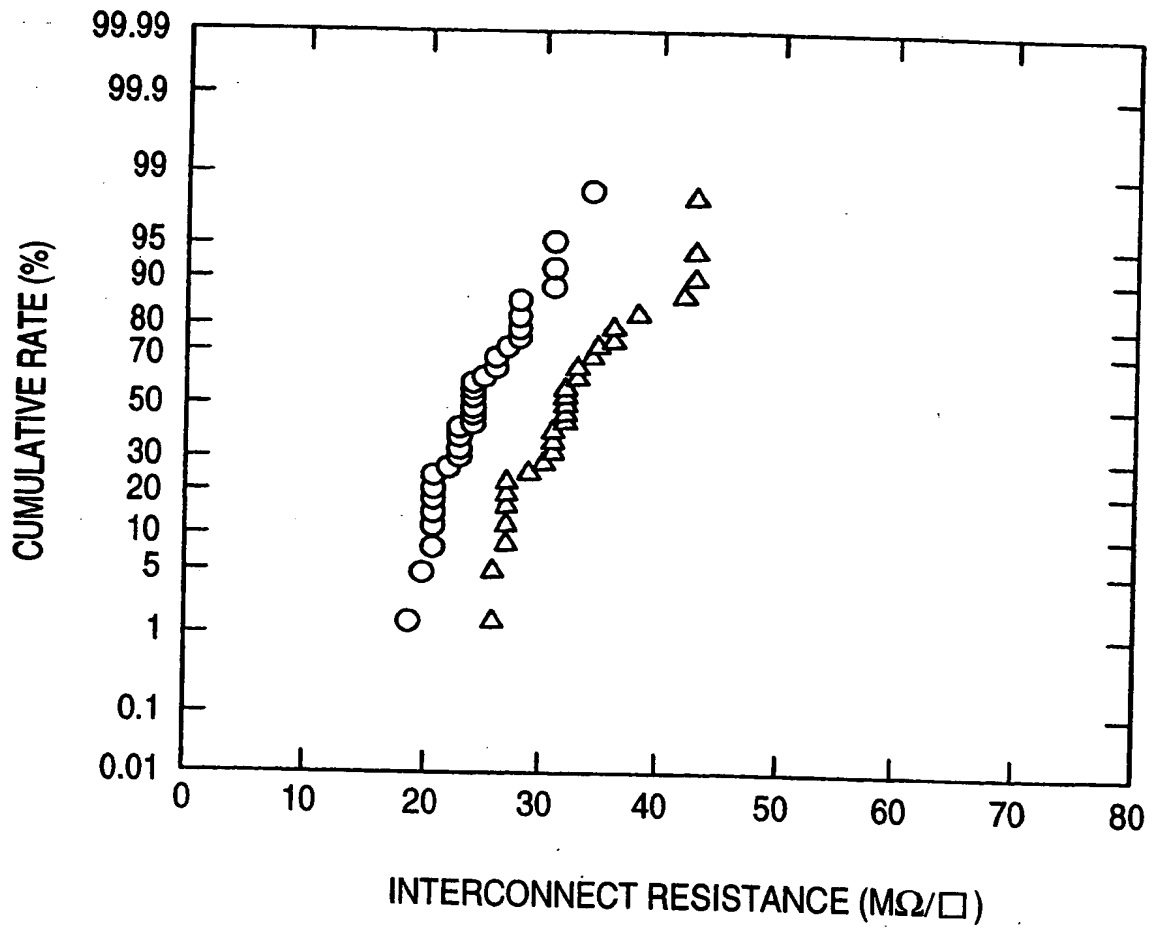


FIG. 29



-△- : DAE+HF CLEANING  
-○- : DAE → H<sub>2</sub> ANNEAL → HF CLEANING

FIG. 30



-△- : DAE+HF CLEANING

-○- : DAE  $\rightarrow$  H<sub>2</sub> ANNEAL  $\rightarrow$  HF CLEANING

FIG. 31

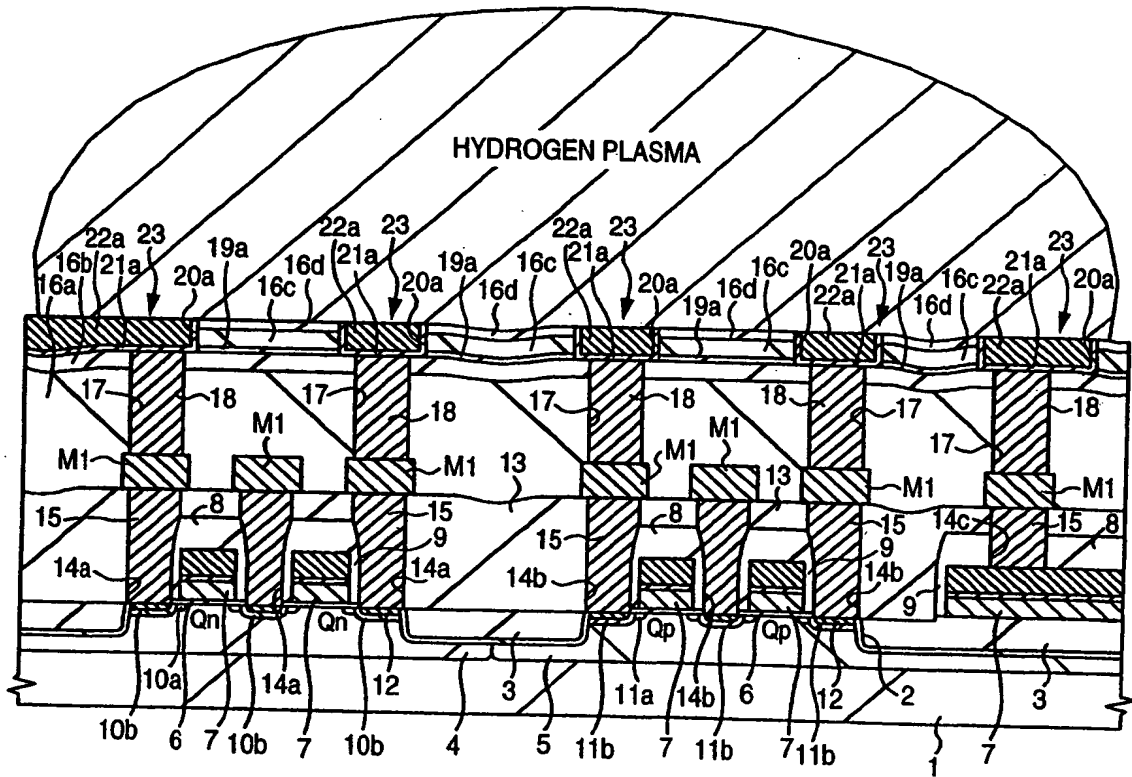
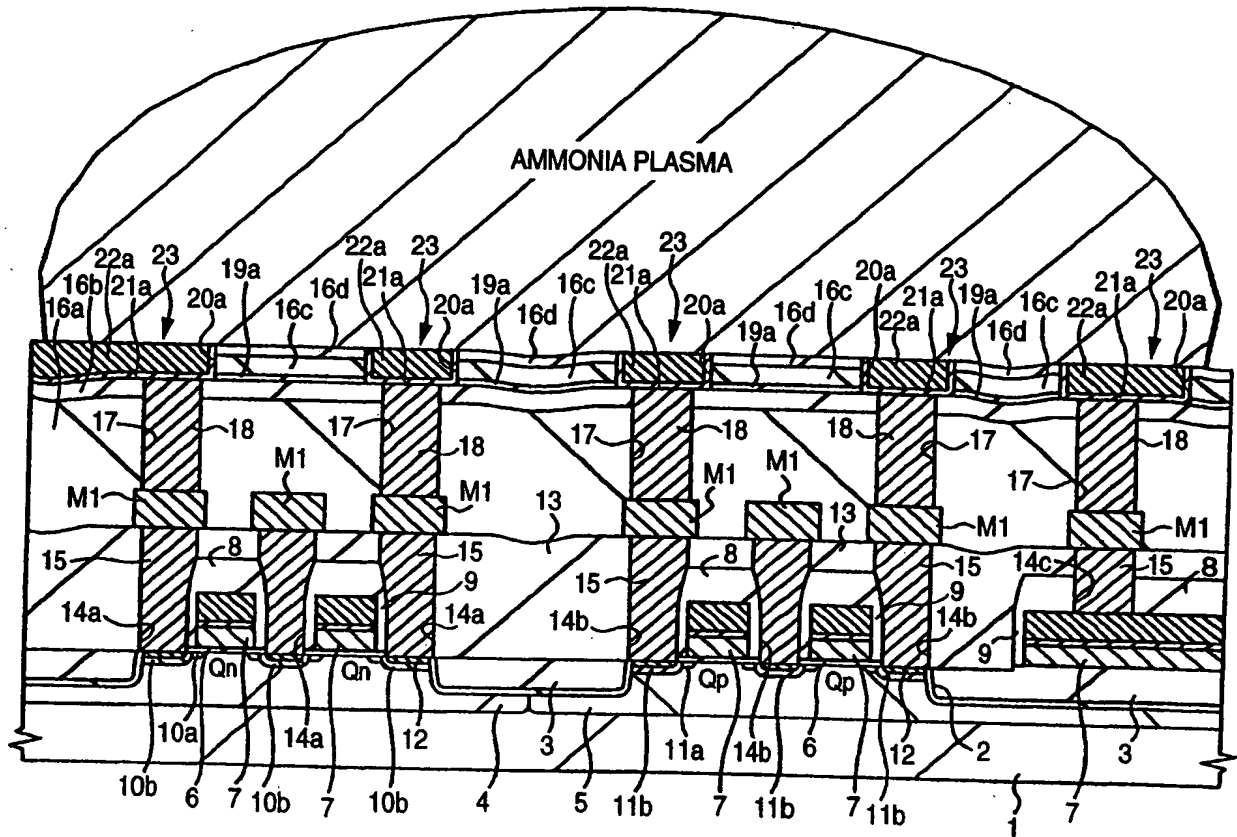


FIG. 32



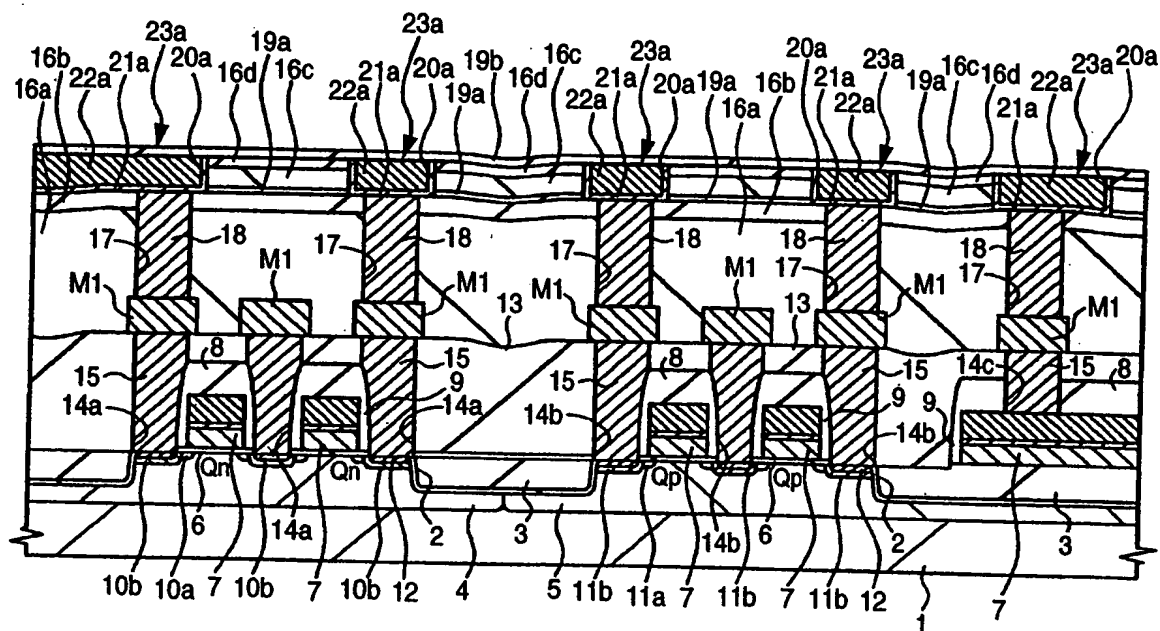
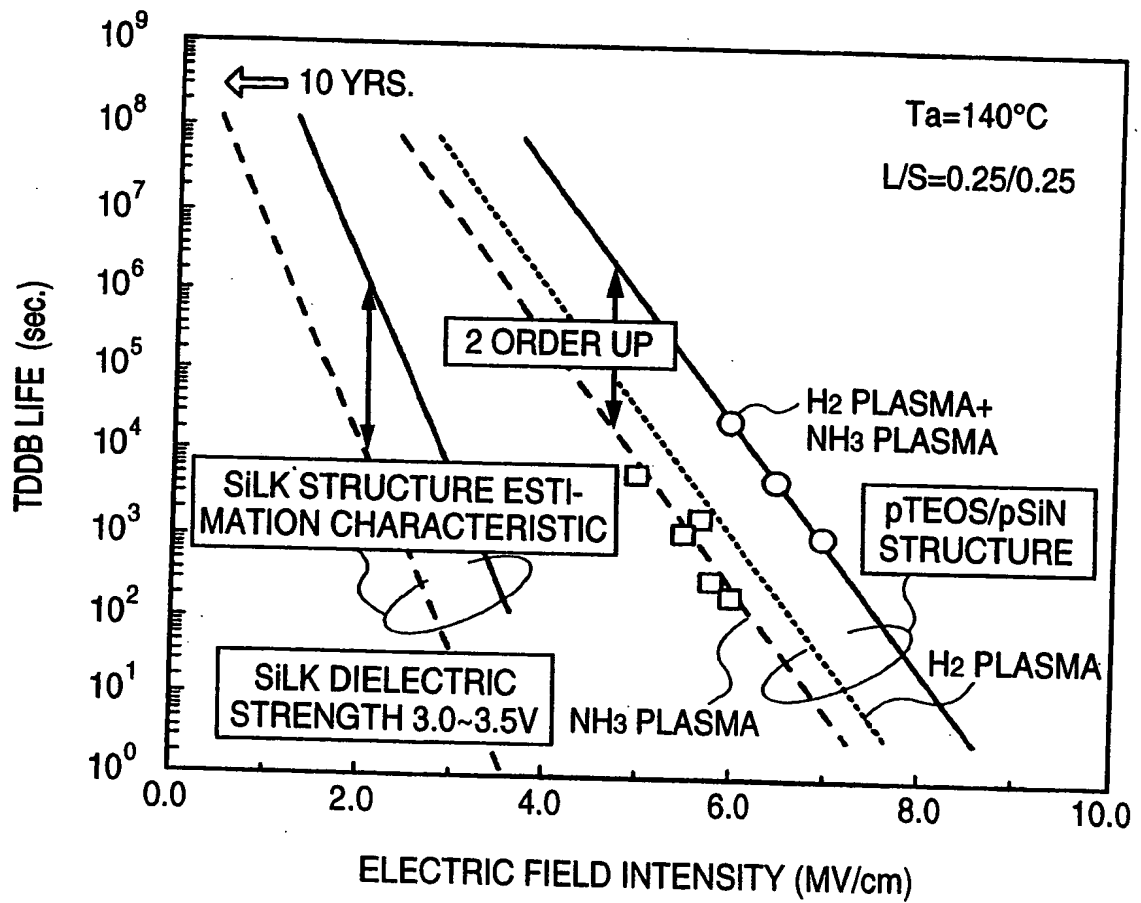


FIG. 34



-□- : NH<sub>3</sub> PLASMA  
-○- : H<sub>2</sub> PLASMA+NH<sub>3</sub> PLASMA



FIG. 35

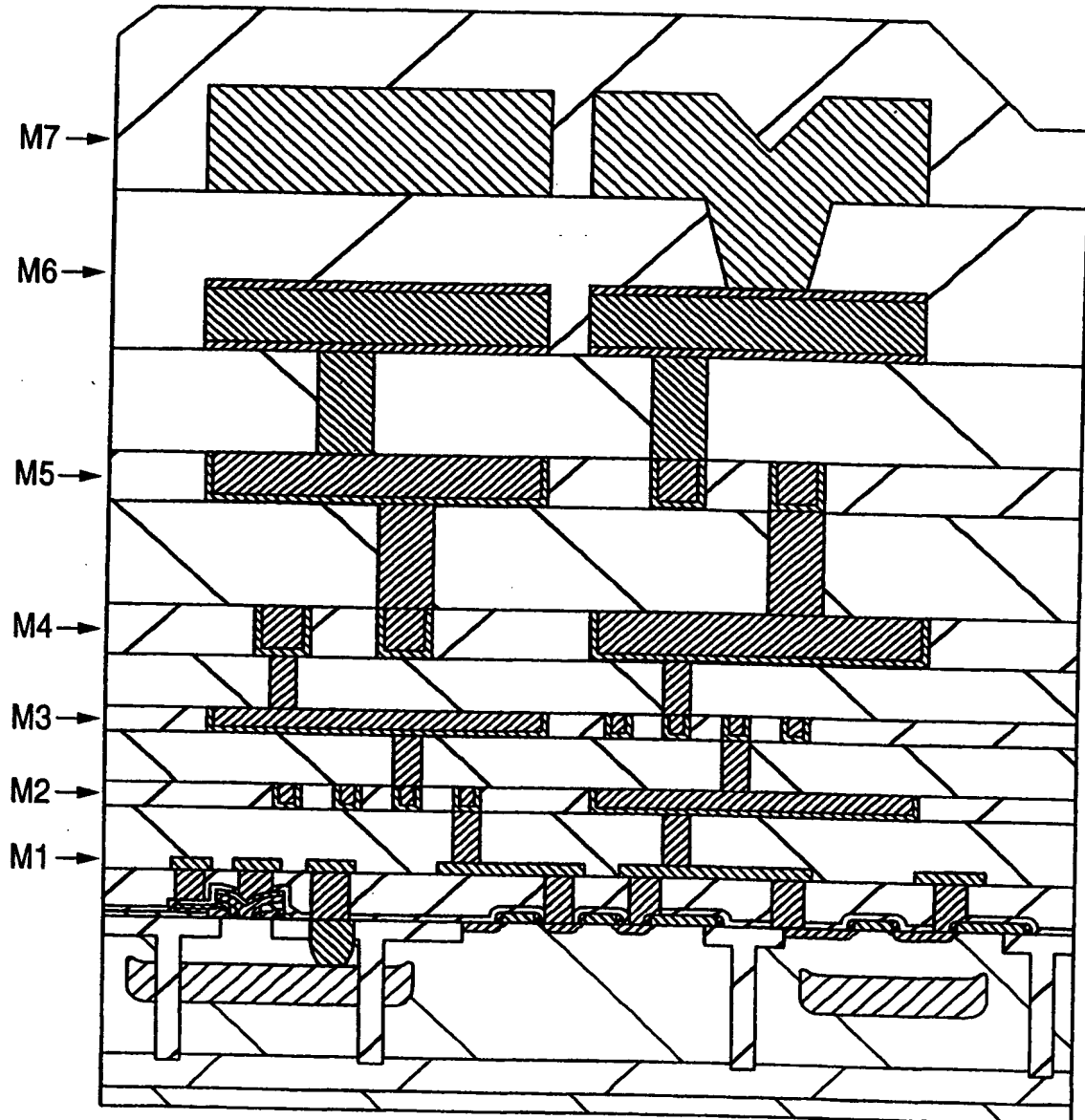


FIG. 36

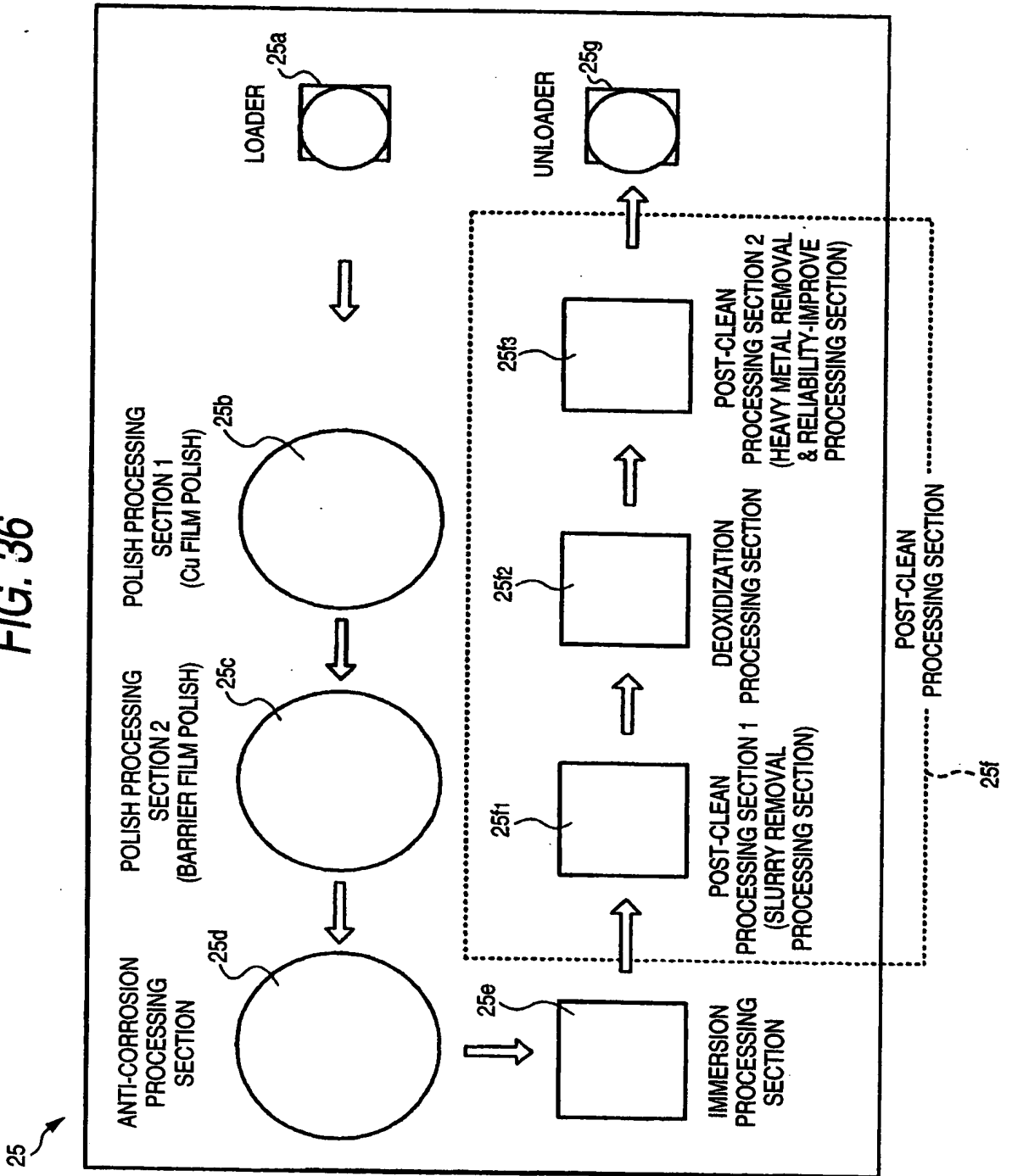


FIG. 37

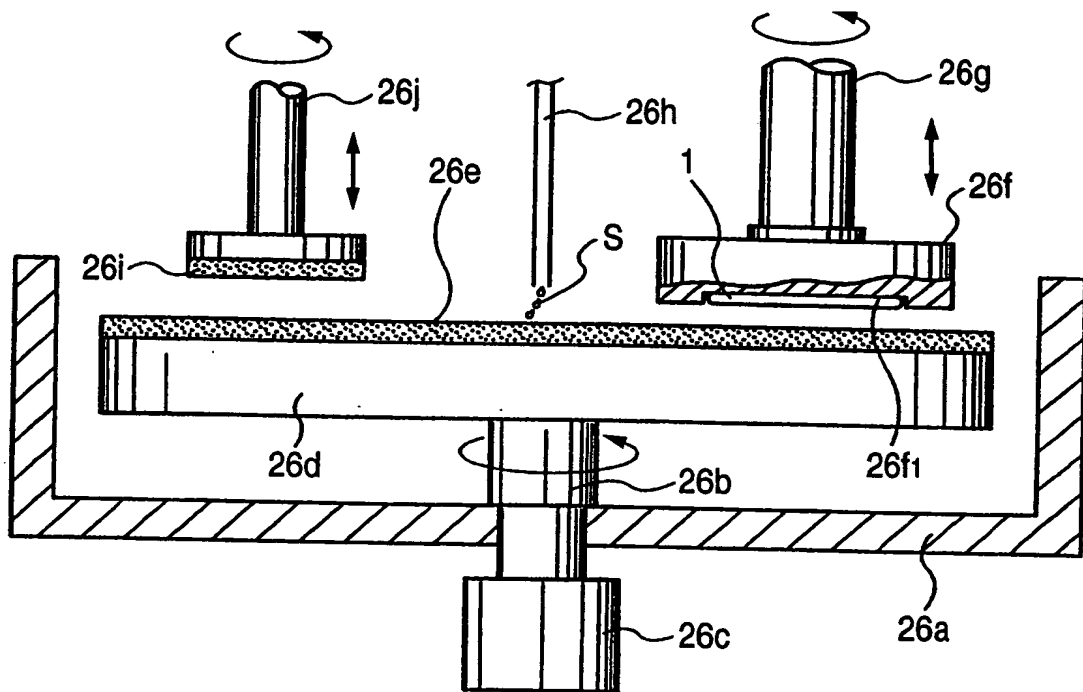


FIG. 38

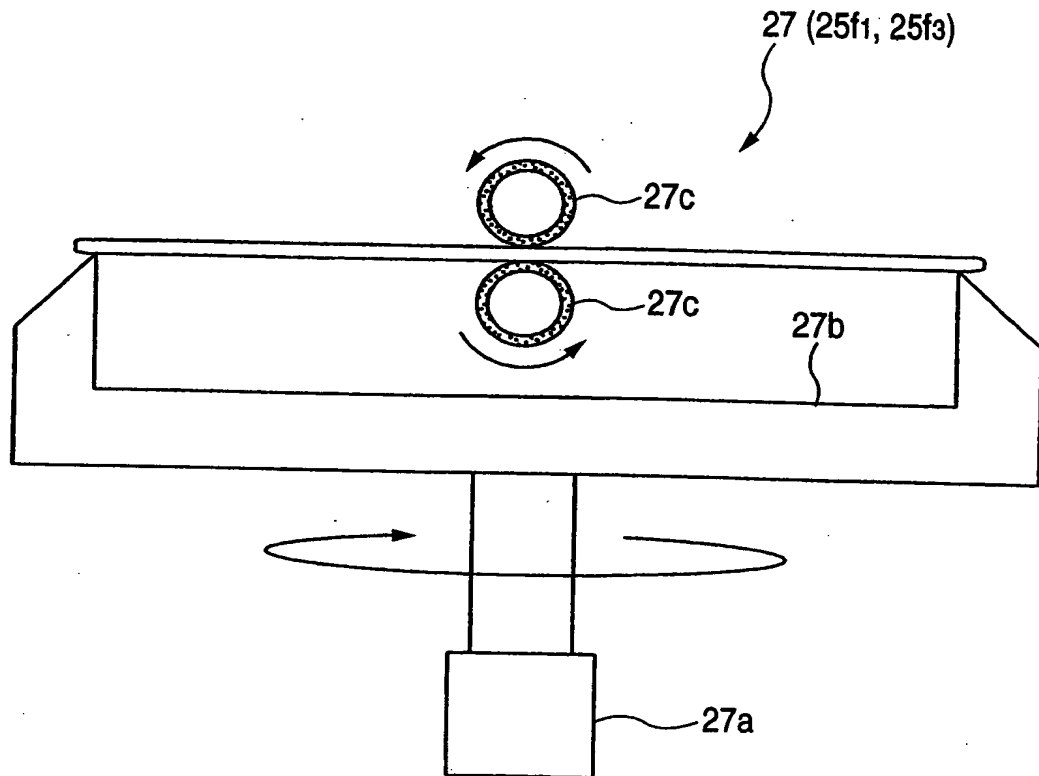


FIG. 39

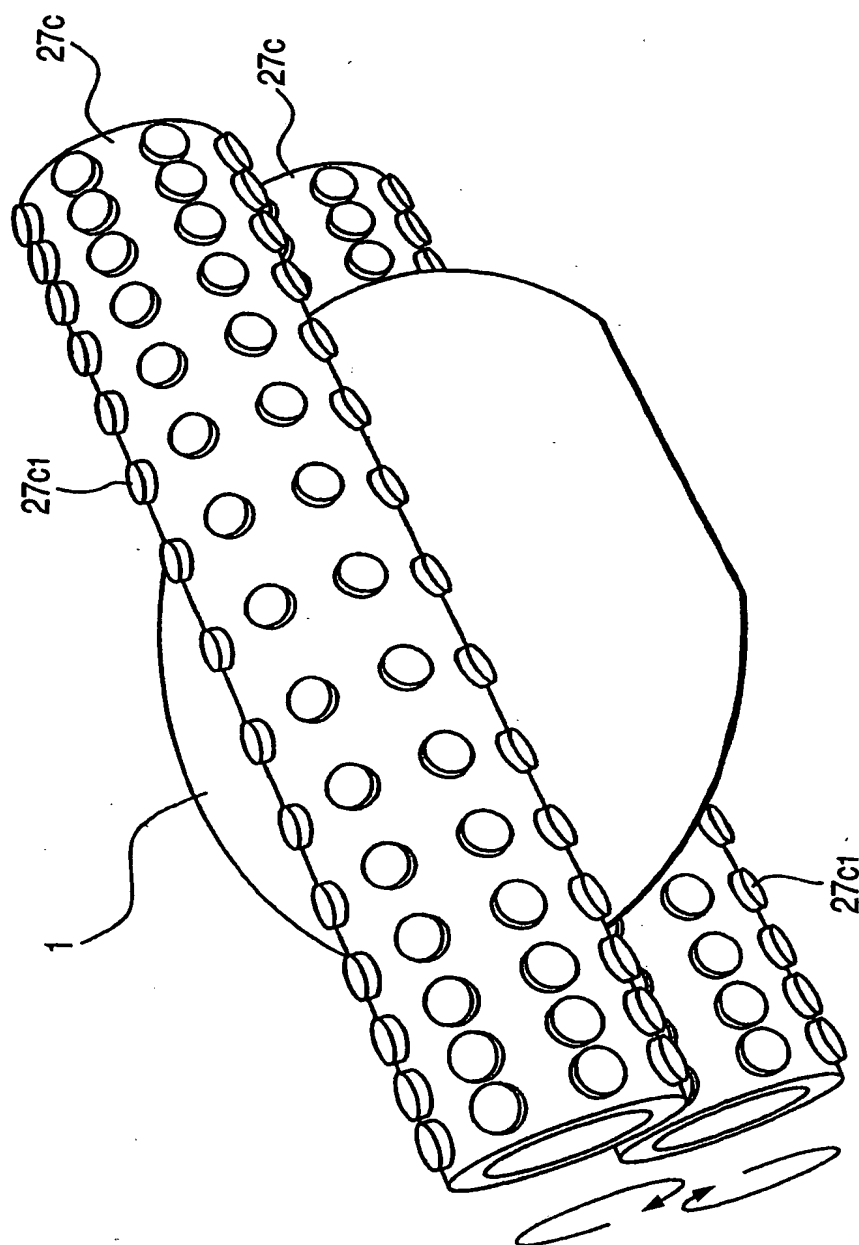


FIG. 40 (a)

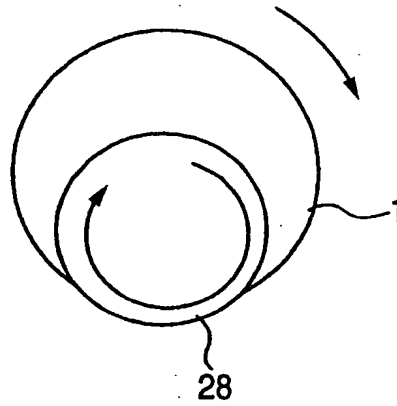


FIG. 40 (b)

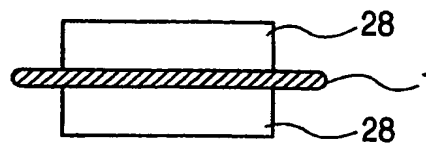


FIG. 41 (a)

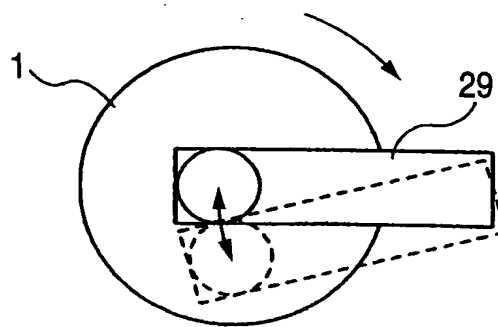


FIG. 41 (b)

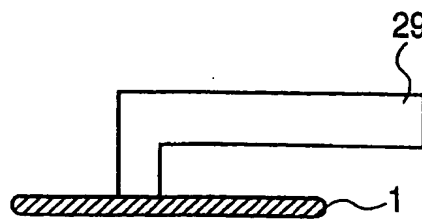


FIG. 42 (b)

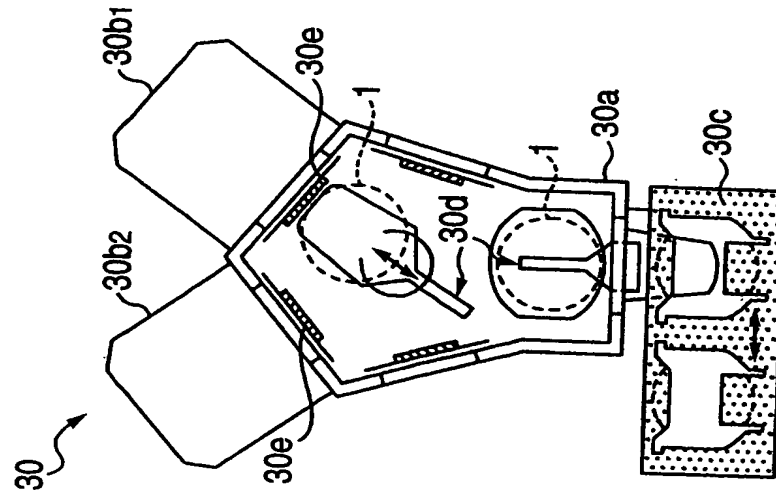


FIG. 42 (a)

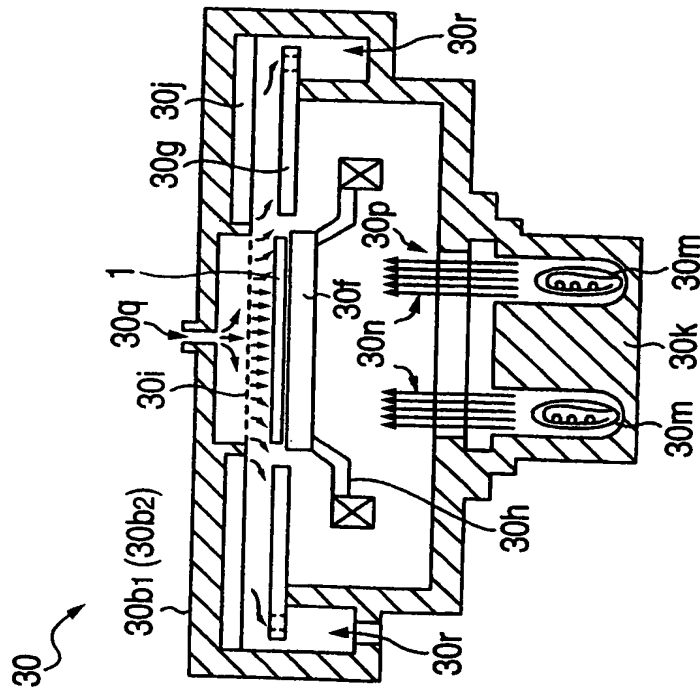


FIG. 43

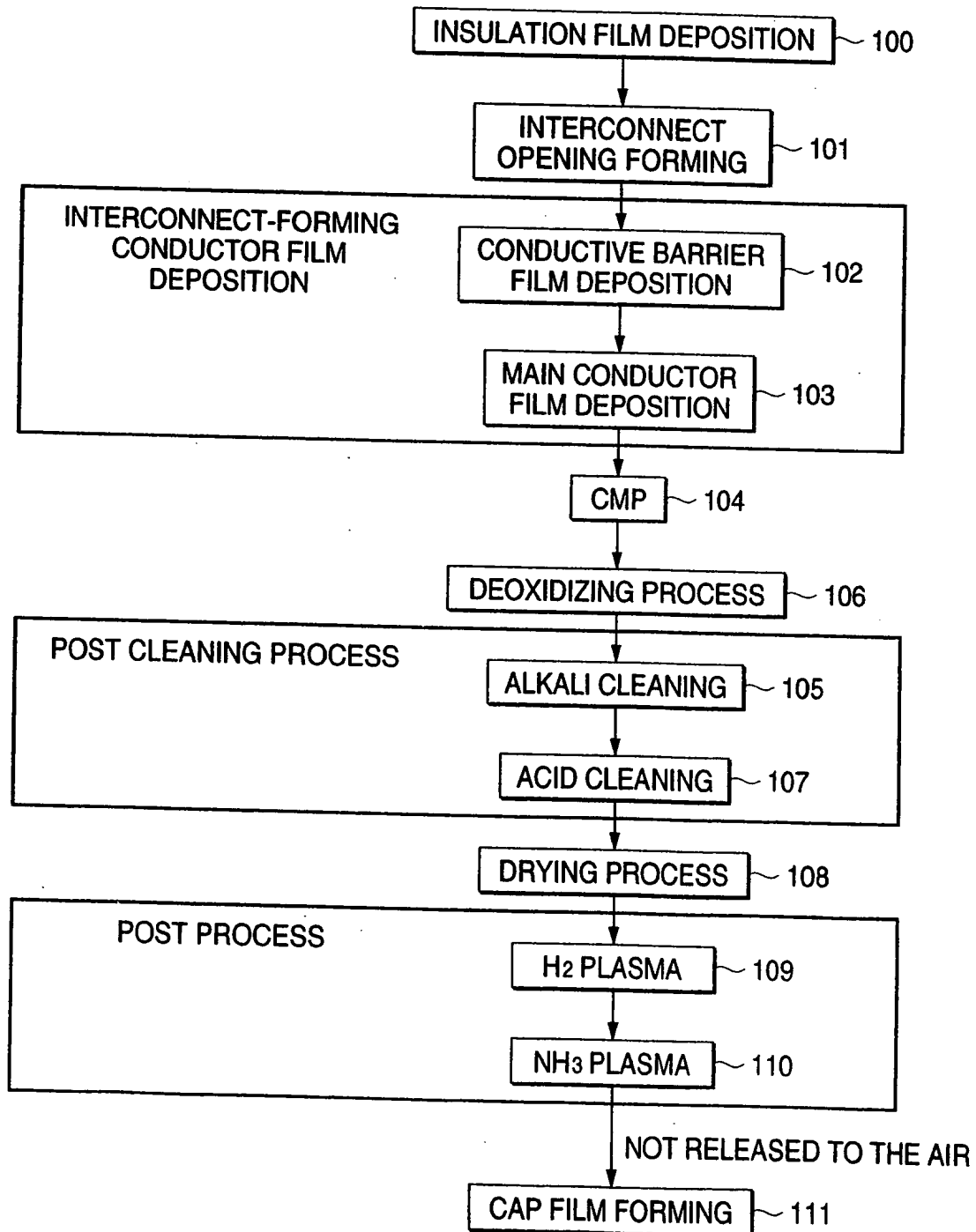




FIG. 44

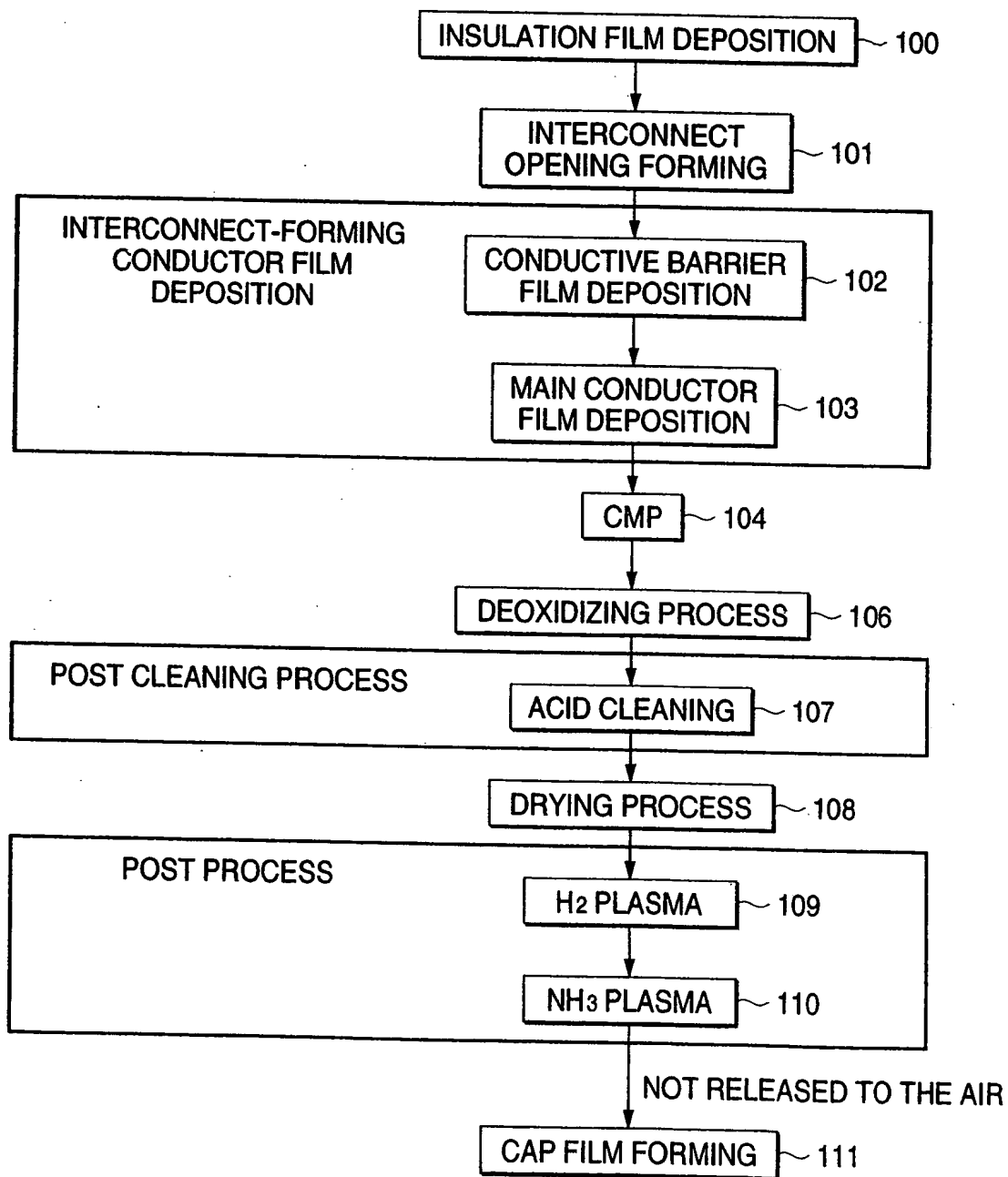


FIG. 45

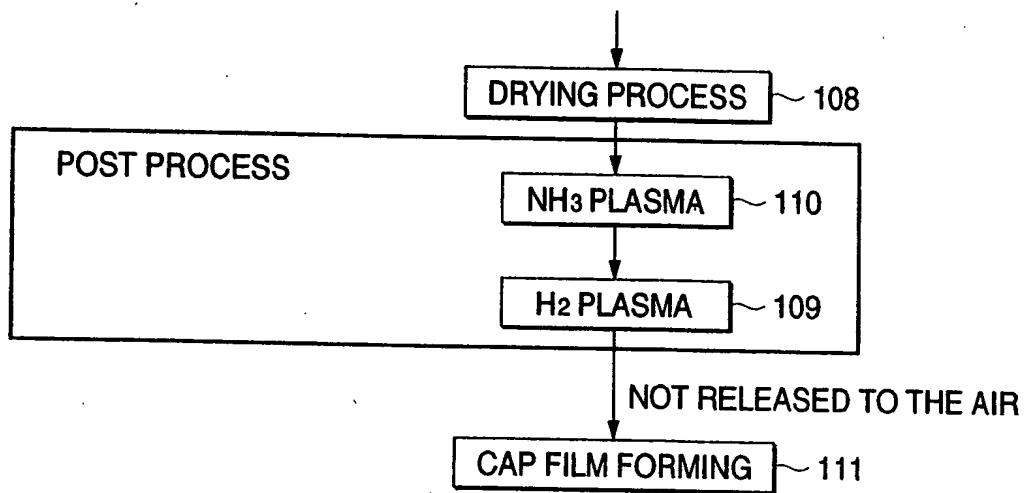


FIG. 46

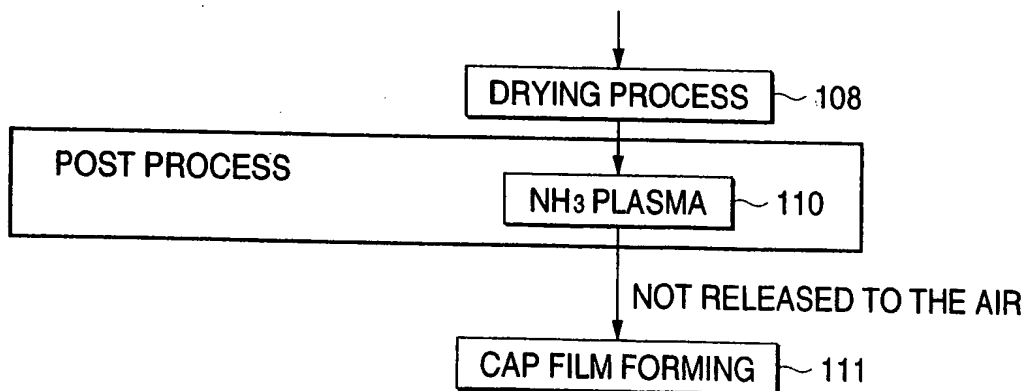


FIG. 47

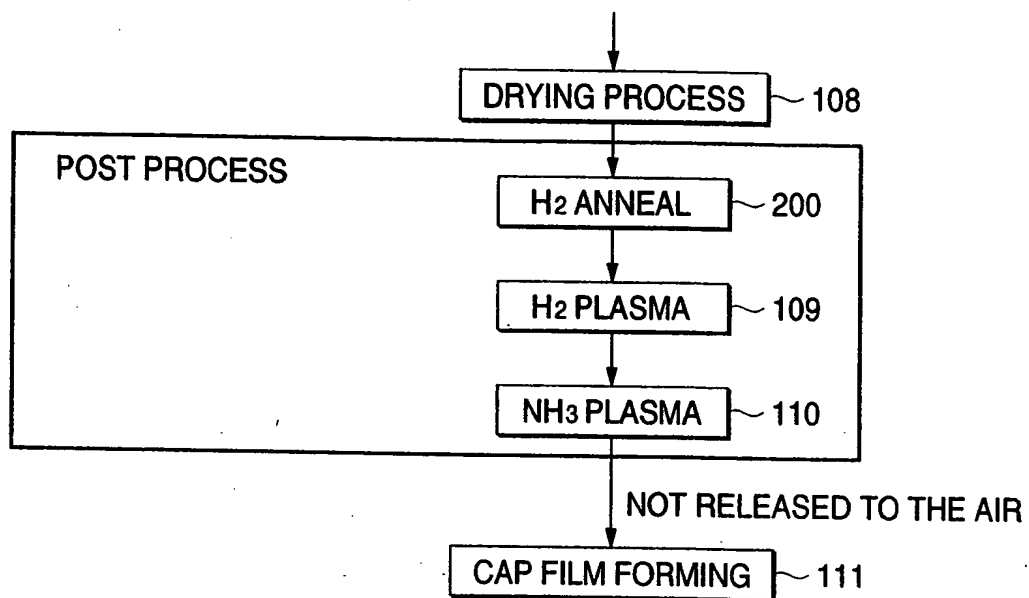


FIG. 48

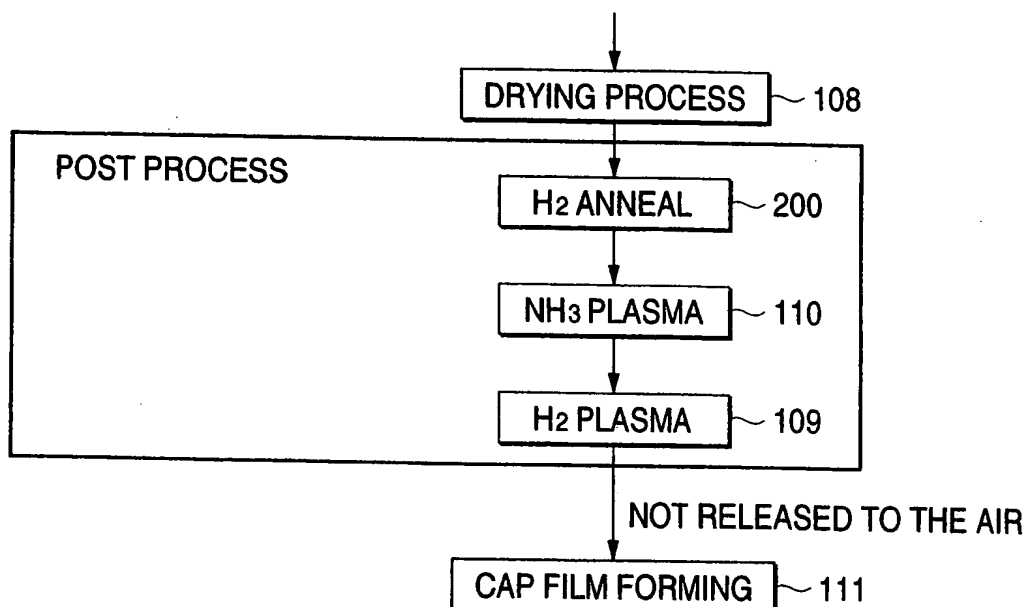


FIG. 49

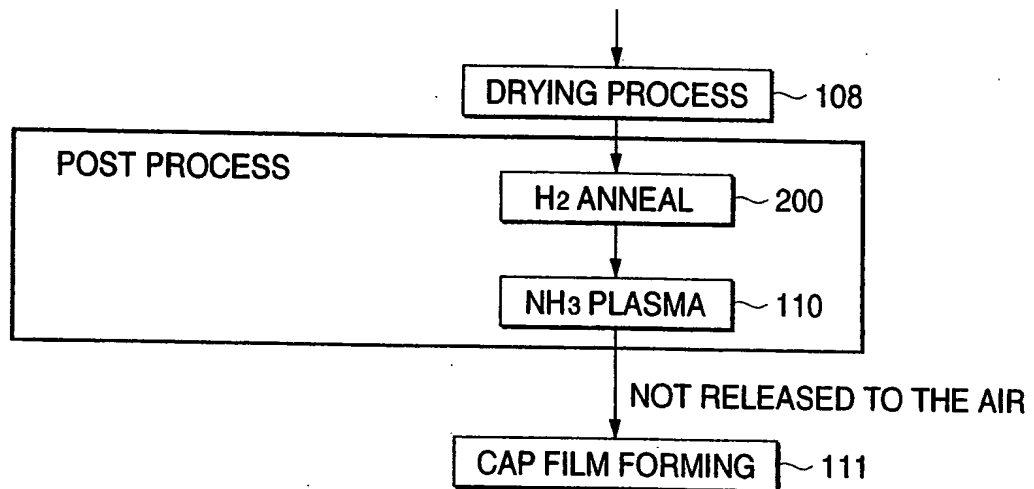


FIG. 50

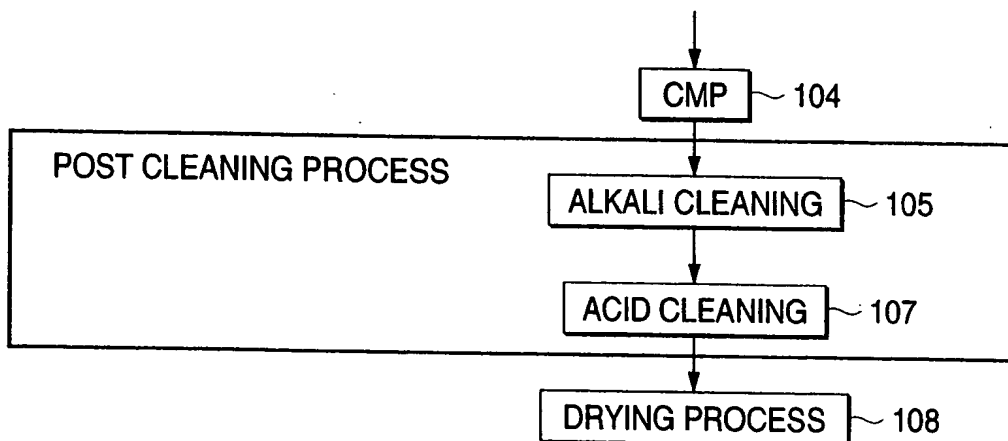


FIG. 51

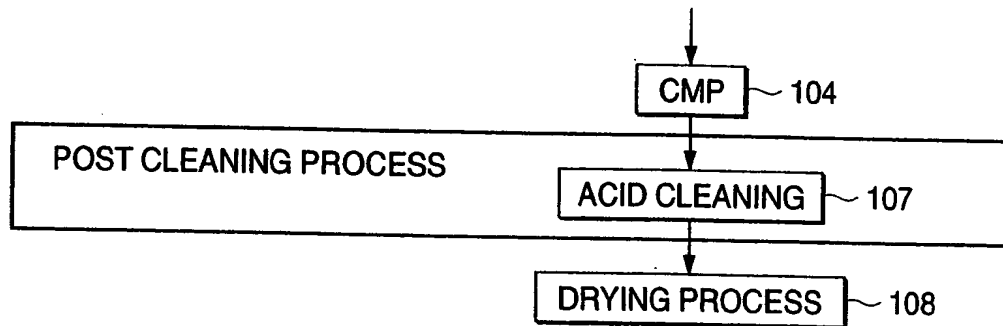


FIG. 52

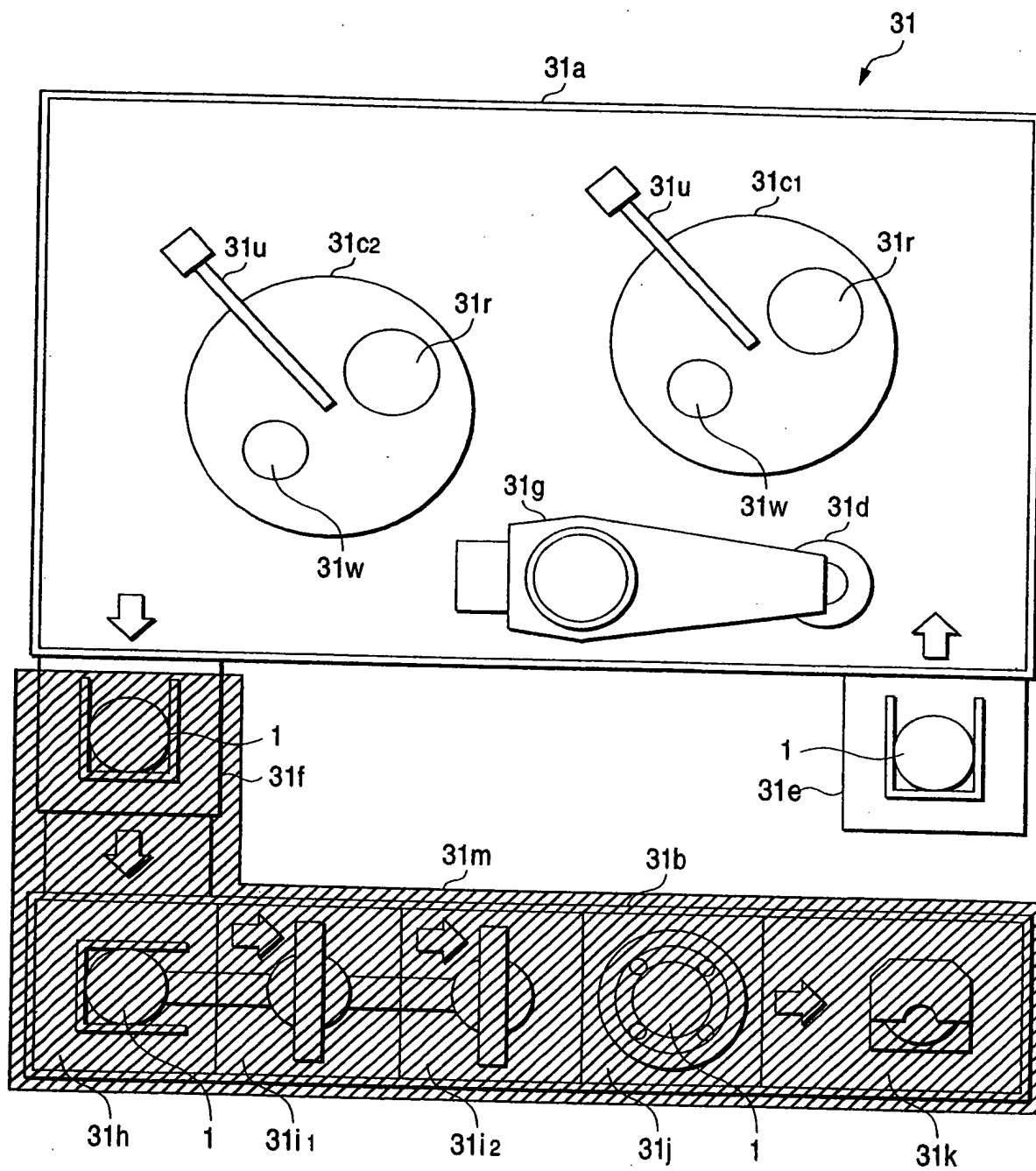


FIG. 53

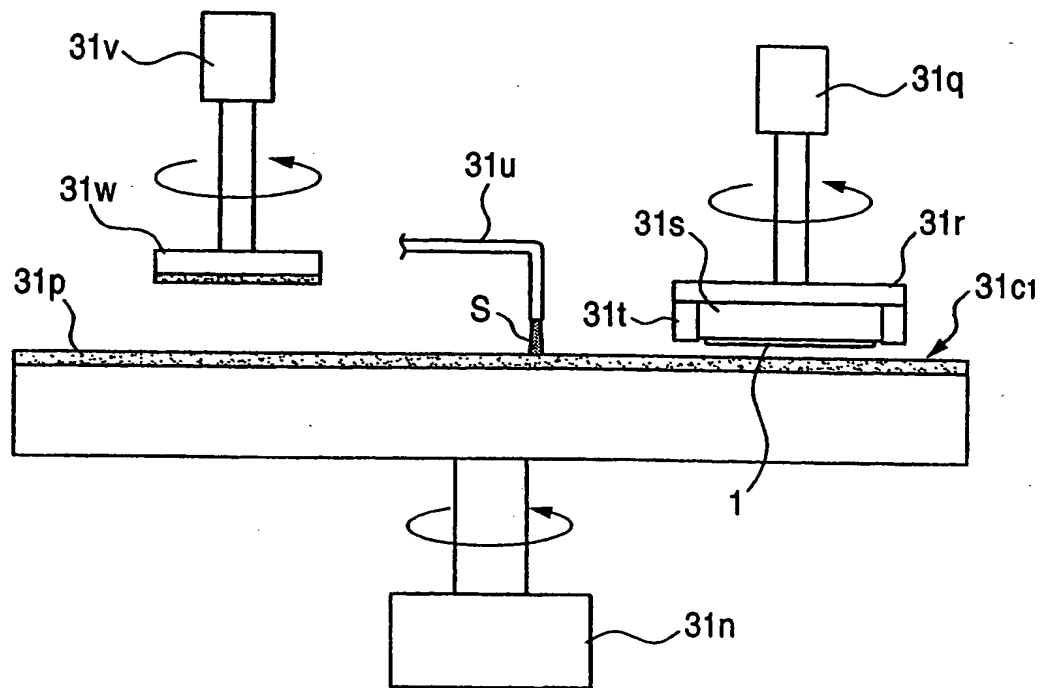


FIG. 54

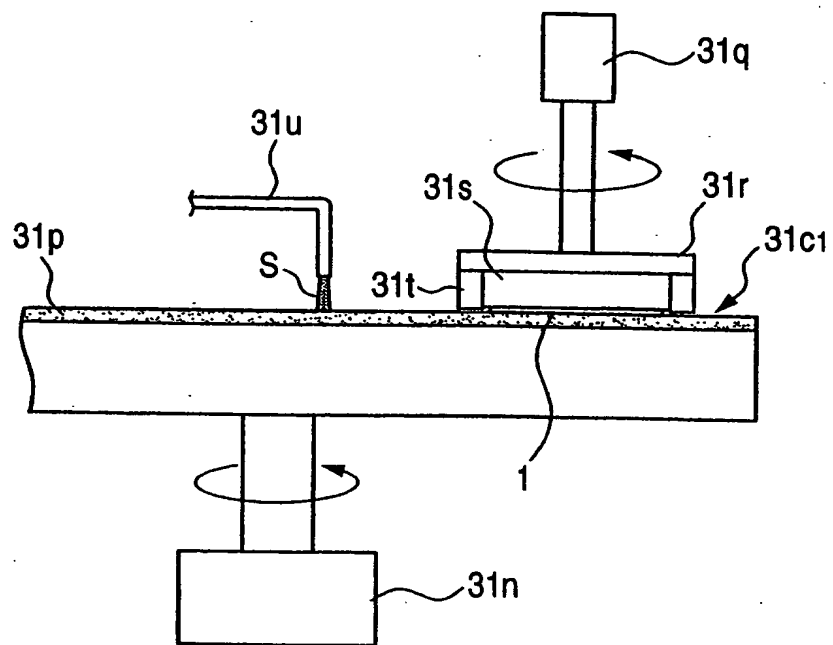
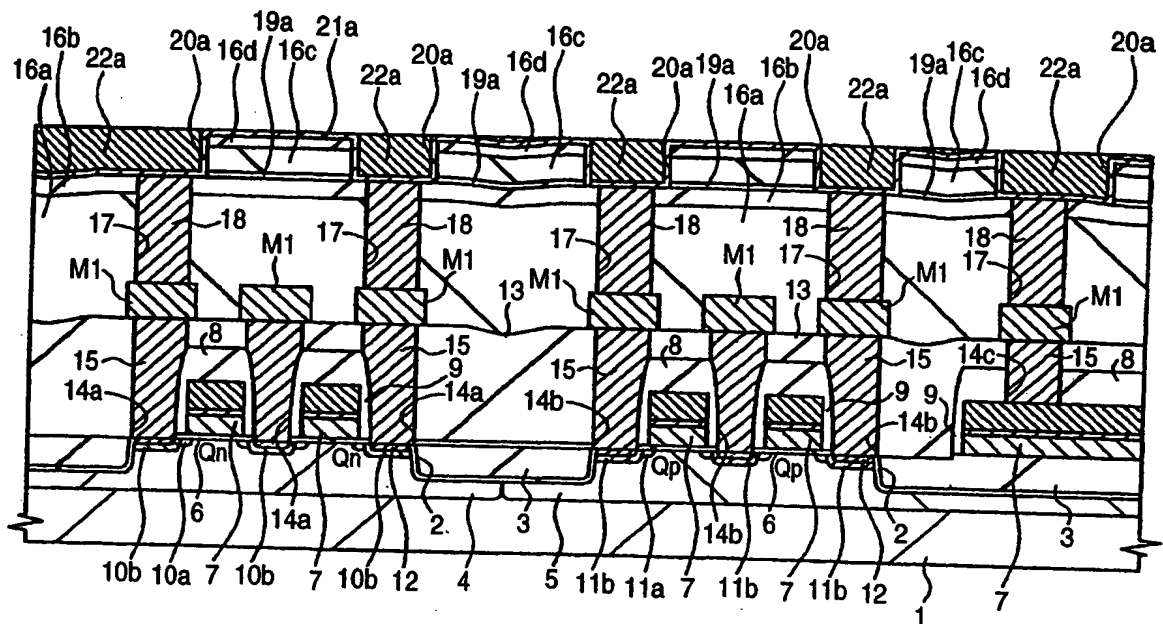




FIG. 55



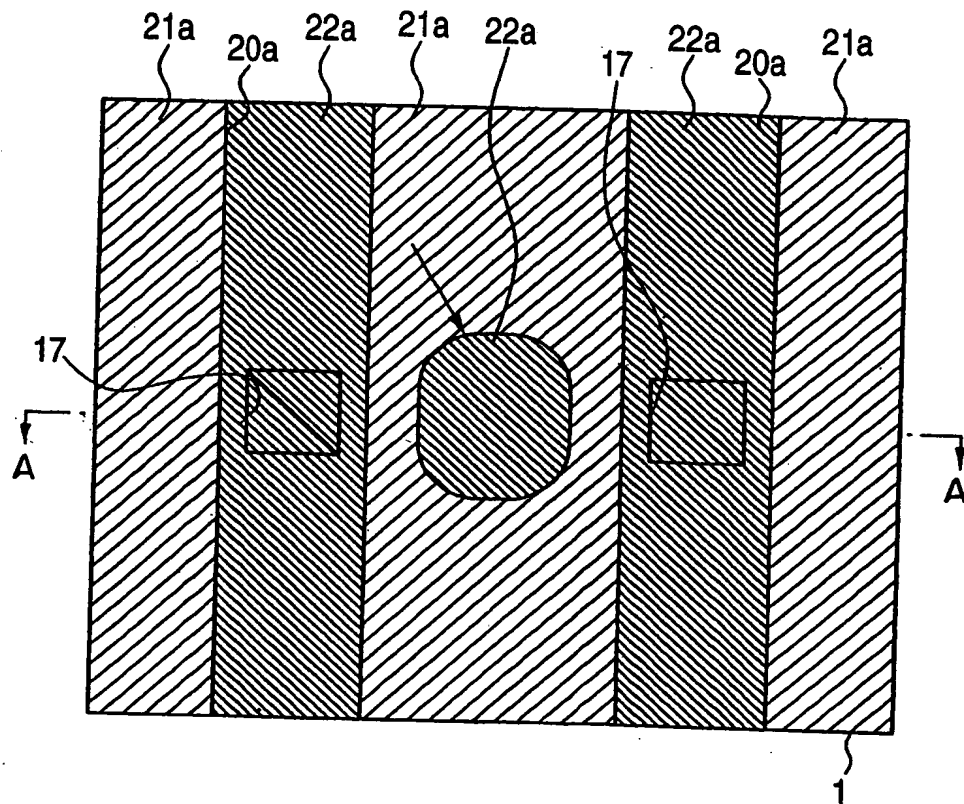
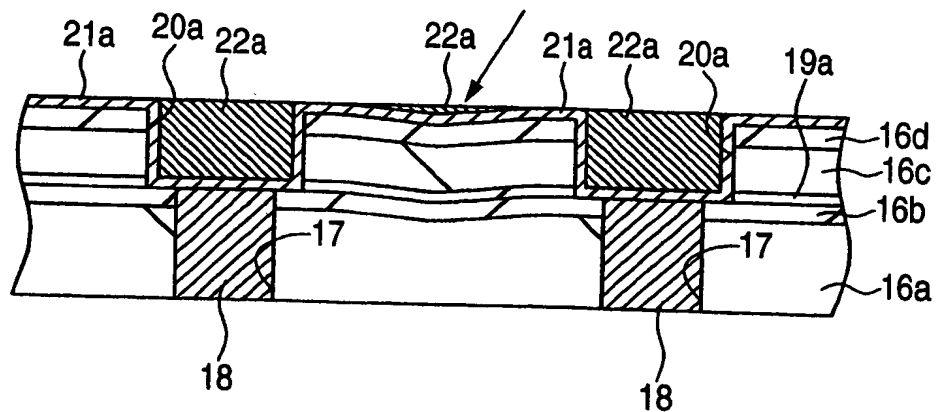
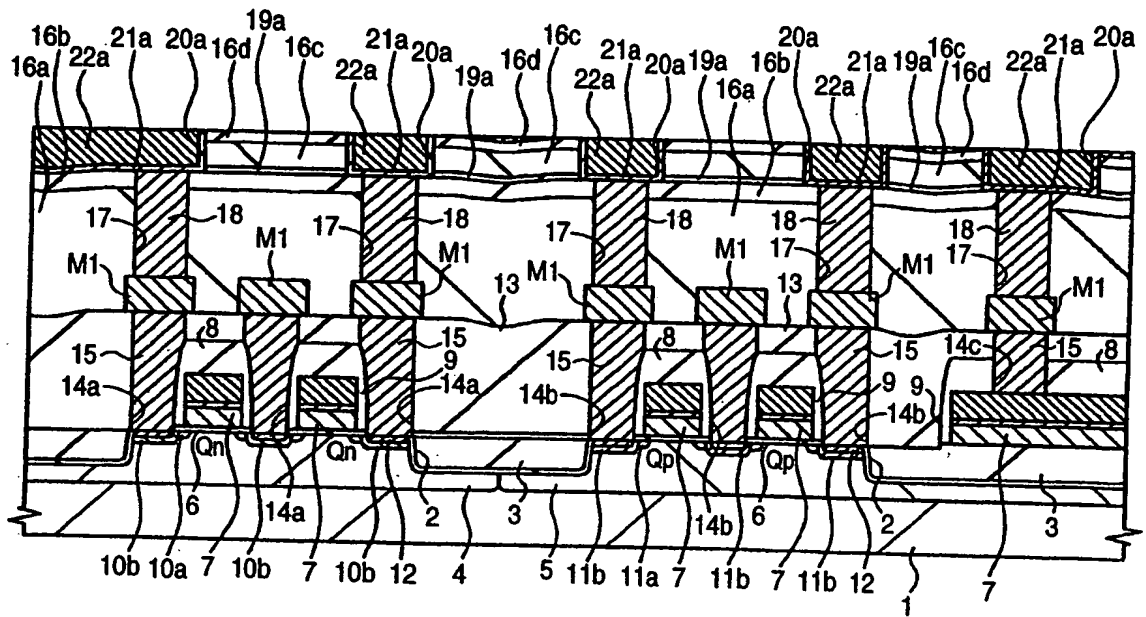
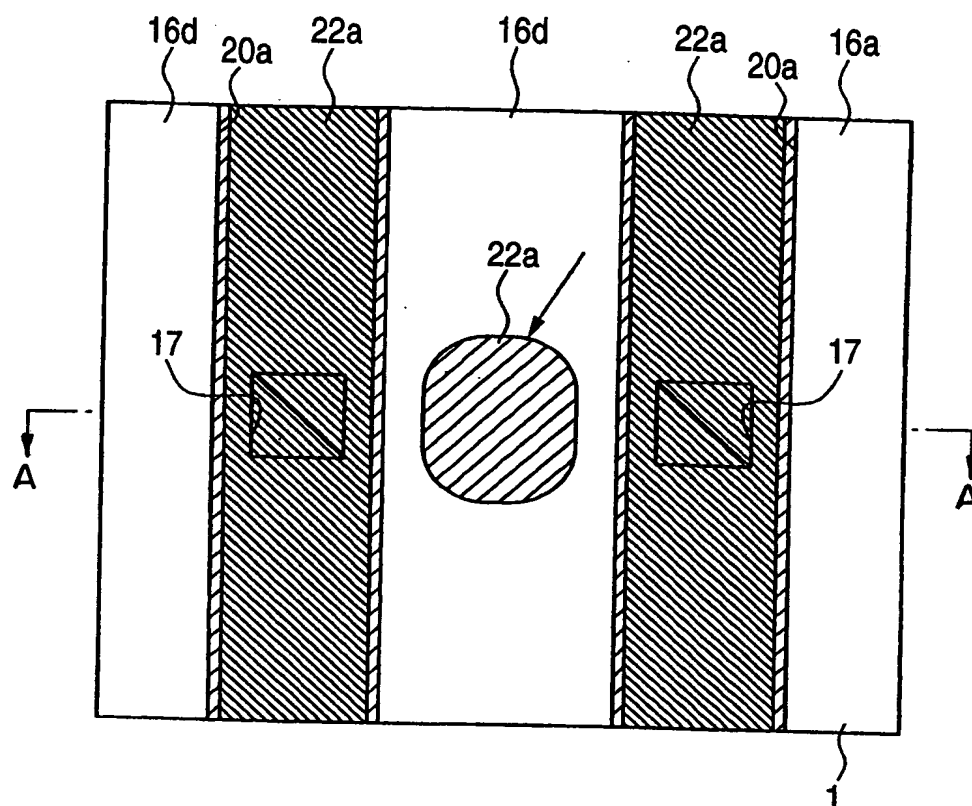
*FIG. 56 (a)**FIG. 56 (b)*

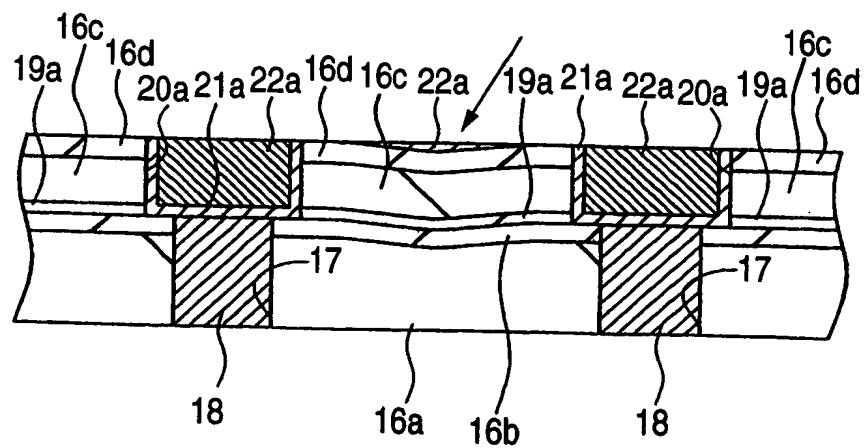
FIG. 57



**FIG. 58 (a)**



**FIG. 58 (b)**



**FIG. 59**

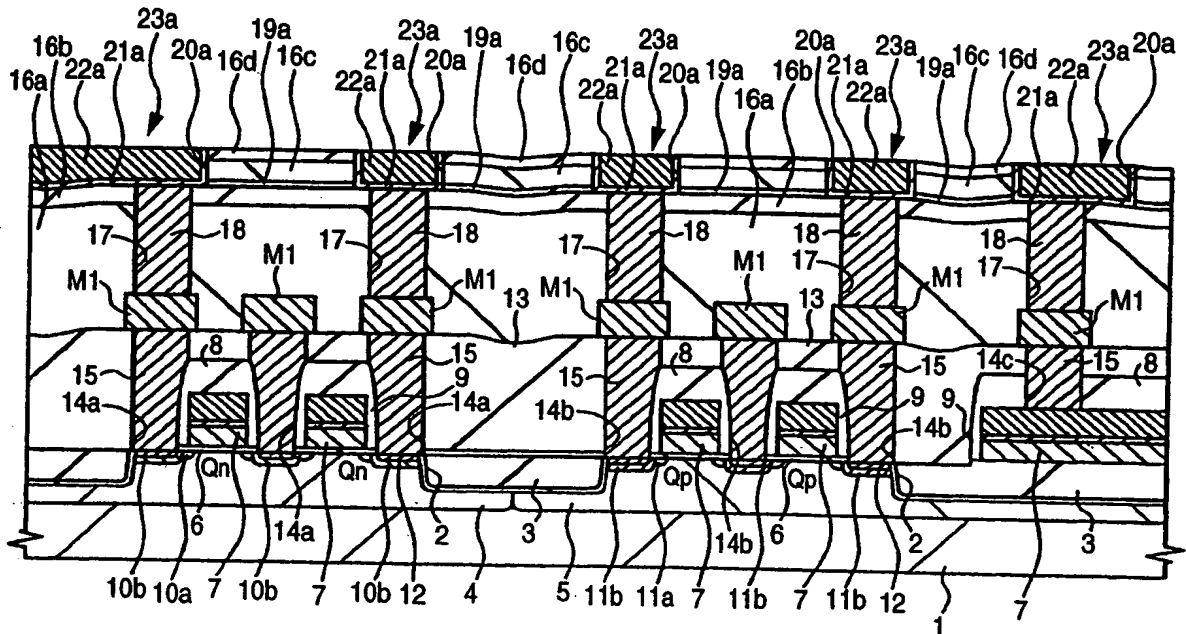


FIG. 60 (a)

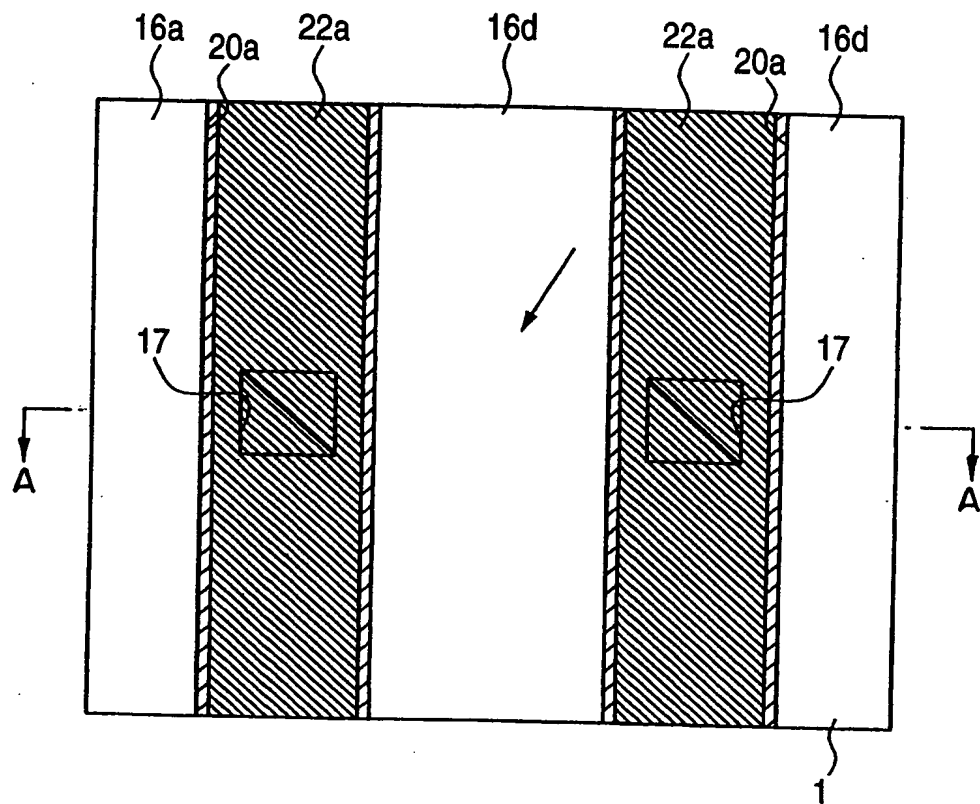


FIG. 60 (b)

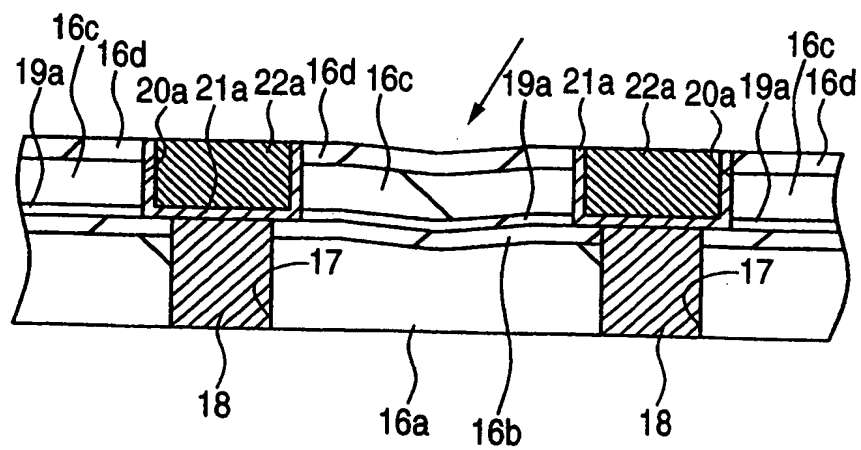


FIG. 61

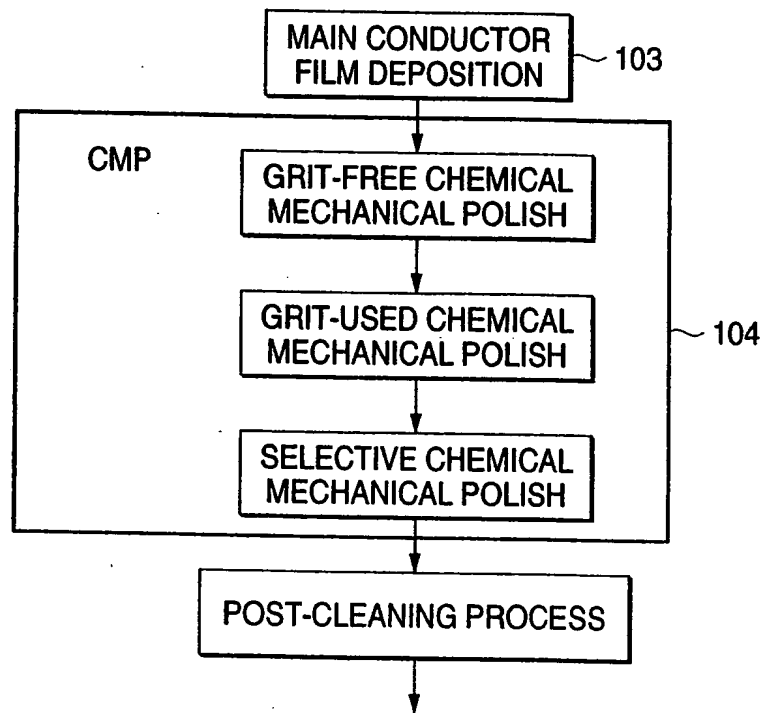
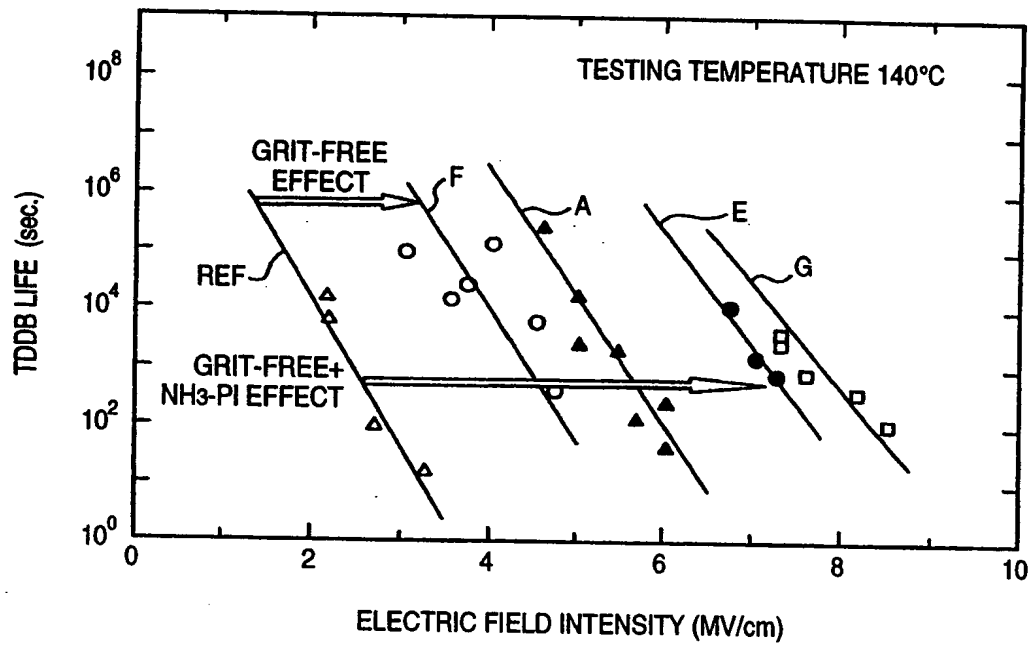


FIG. 62

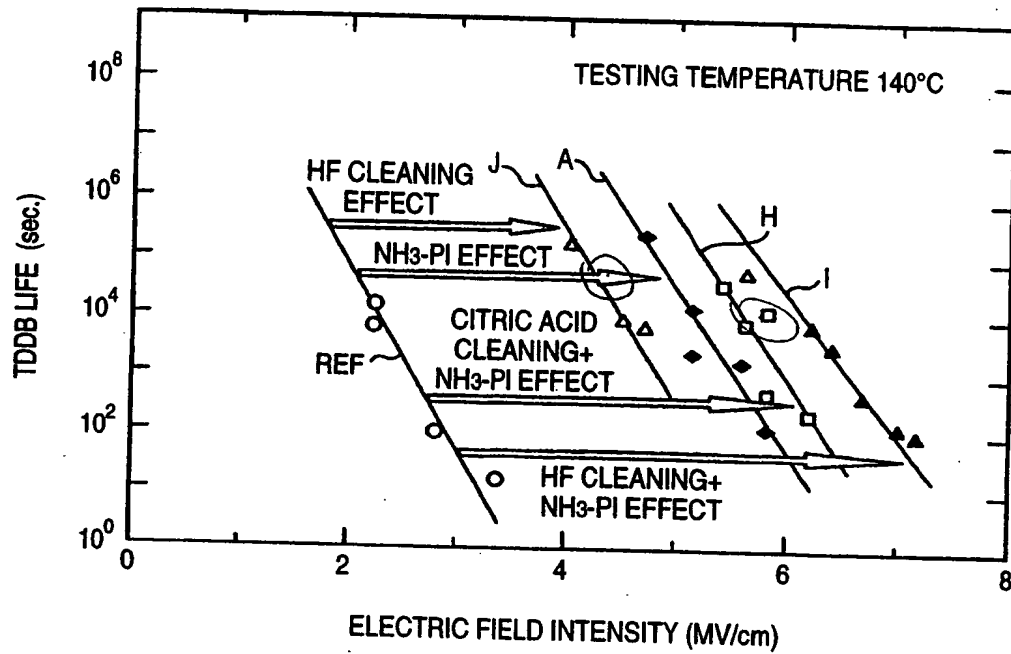


- △ : NO QCTT → NH<sub>3</sub>+PI.
- ▲ : QCTT → NH<sub>3</sub>+PI. PRESENT
- : NO HS4000 → NH<sub>3</sub>+PI.
- : HS4000 → NH<sub>3</sub>+PI. PRESENT
- : HS4000 → NH<sub>3</sub>+PI. PRESENT (HF CLEANING)



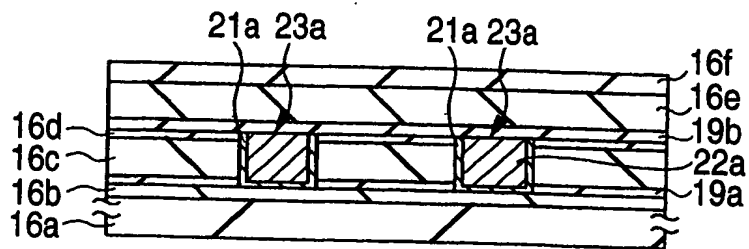
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FIG. 63



- : NO NH<sub>4</sub>OH CLEANING → NH<sub>3</sub>-PI
- △ : NO HF CLEANING → NH<sub>3</sub>-PI
- ◆ : NH<sub>4</sub>OH CLEANING → NH<sub>3</sub>-PI PRESENT
- : CITRIC ACID CLEANING → NH<sub>3</sub>-PI PRESENT
- ▲ : HF CLEANING → NH<sub>3</sub>-PI PRESENT

FIG. 64



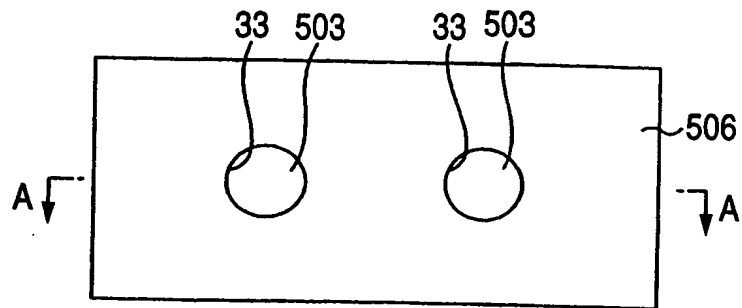
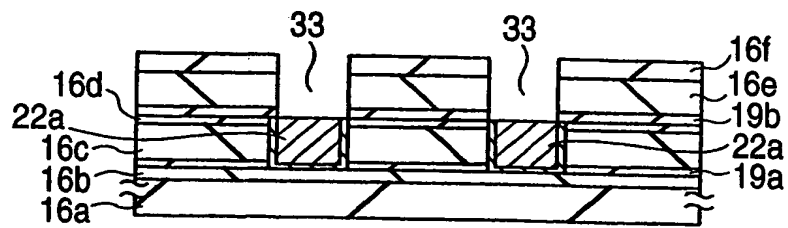
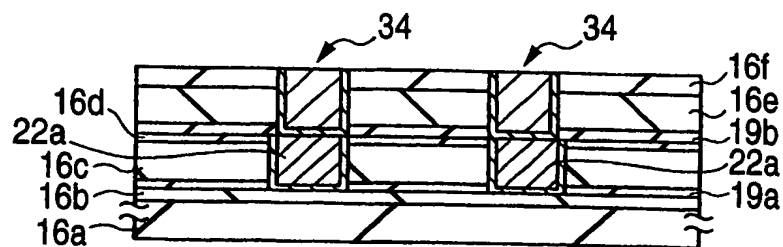
*FIG. 65 (a)**FIG. 65 (b)**FIG. 66*

FIG. 67

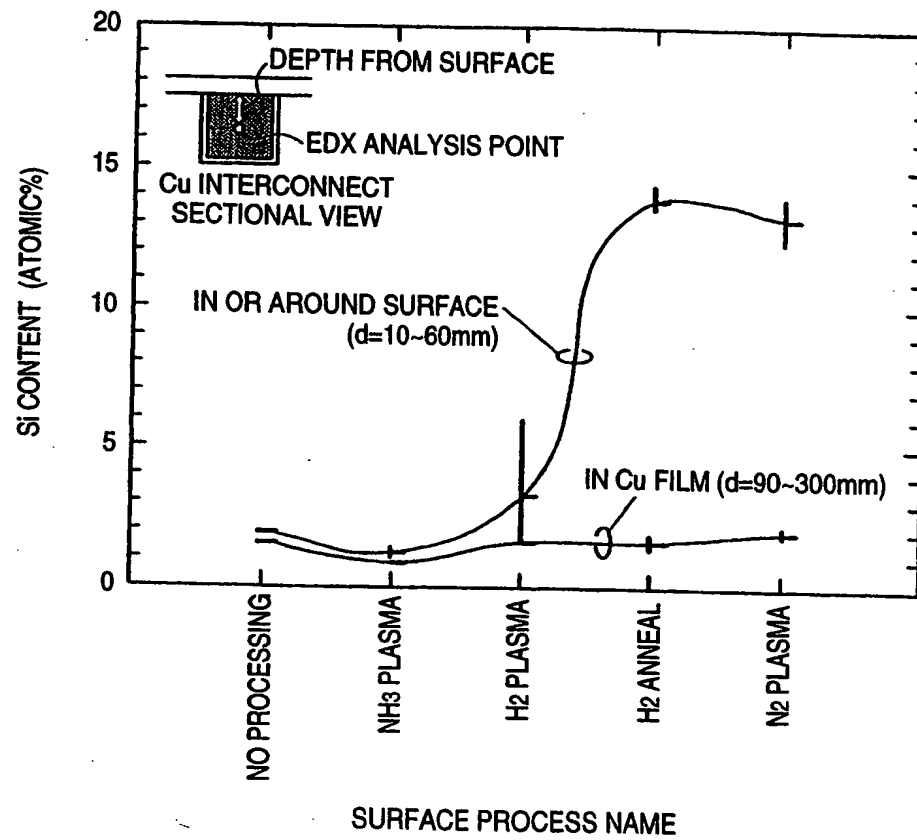
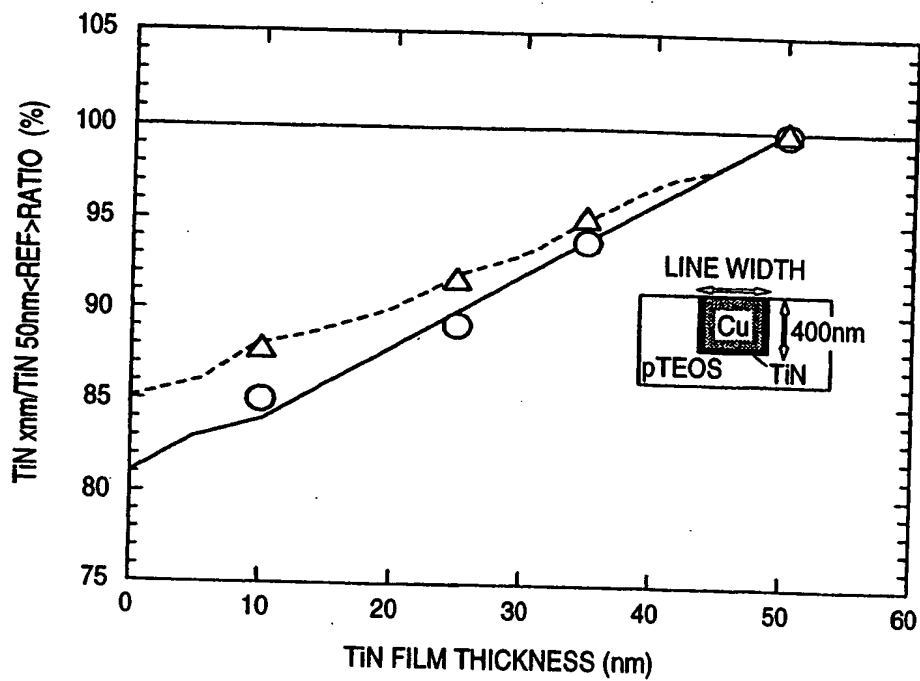


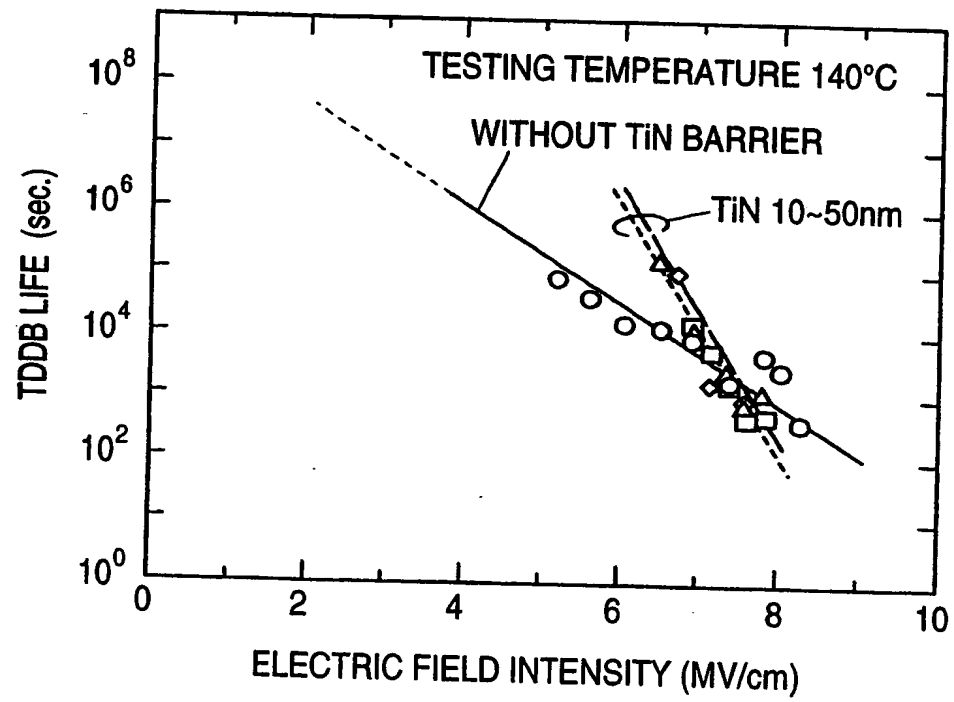
FIG. 68



\* TIN FILM THICKNESS=TRENCH-BOTTOM FILM THICKNESS

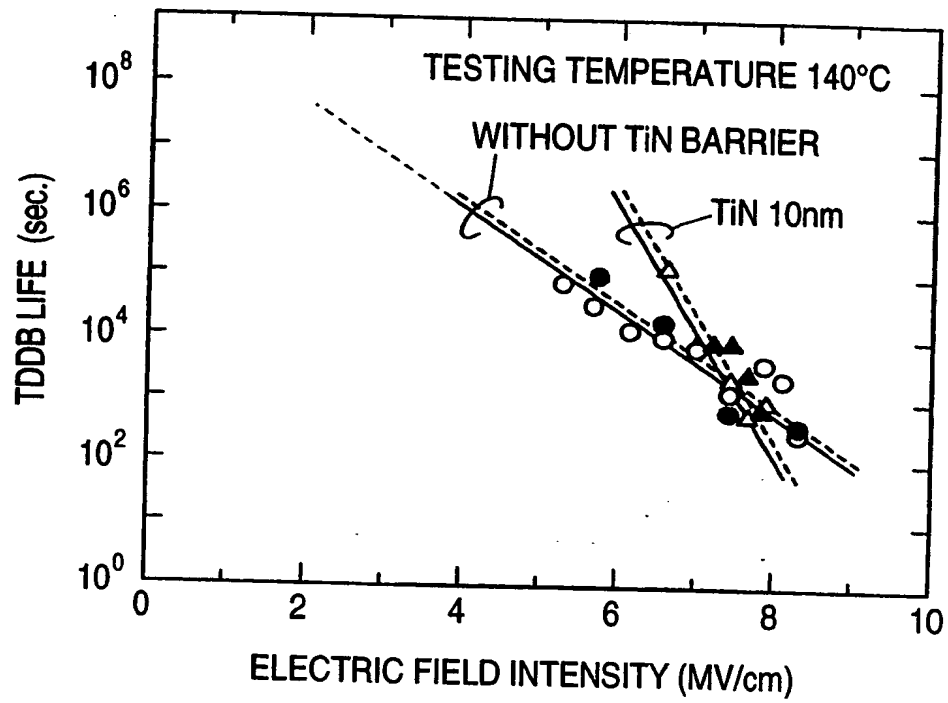
- : LINE WIDTH 0.4μm (MEASUREMENT VALUE)
- △ : LINE WIDTH 1.0μm (MEASUREMENT VALUE)
- : LINE WIDTH 0.4μm (CALCULATED VALUE)
- - - : LINE WIDTH 1.0μm (CALCULATED VALUE)

FIG. 69



- : TiN 0nm
- △ : TiN 10nm
- : TiN 25nm
- ◇ : TiN 50nm

FIG. 70



- : TiN 0nm
- △— : TiN 10nm
- : TiN 0nm (400°C 3HOURS N<sub>2</sub>ANNEAL)
- ▲--- : TiN 10nm (400°C 3HOURS N<sub>2</sub>ANNEAL)

FIG. 71 (a)

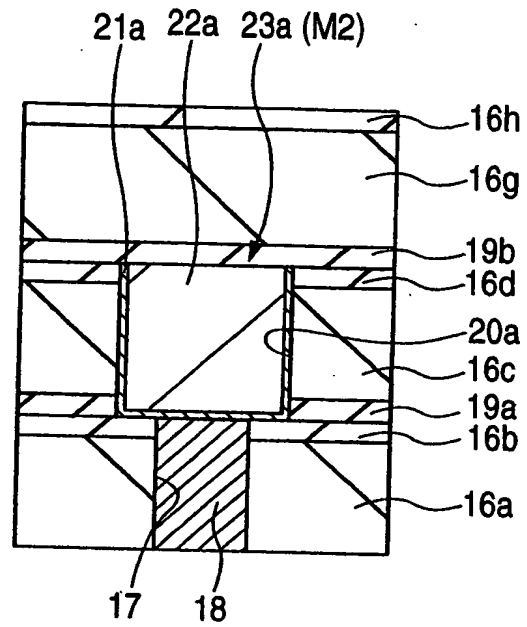


FIG. 71 (b)

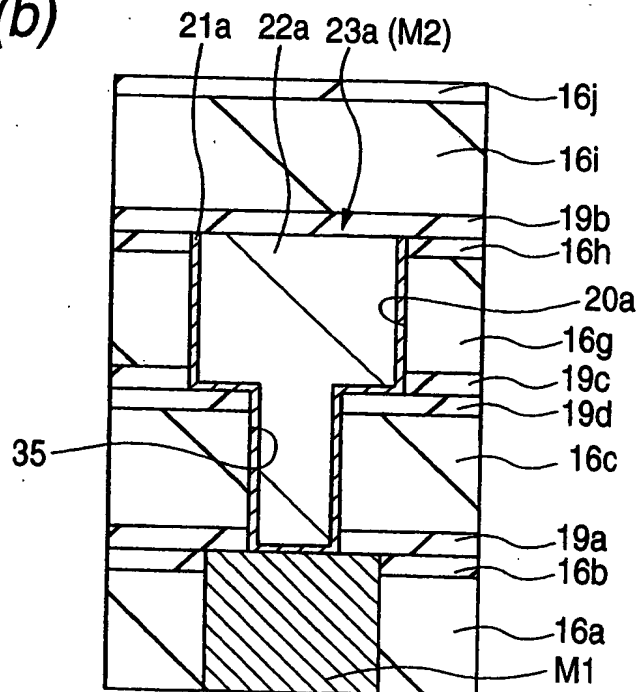


FIG. 72 (a)

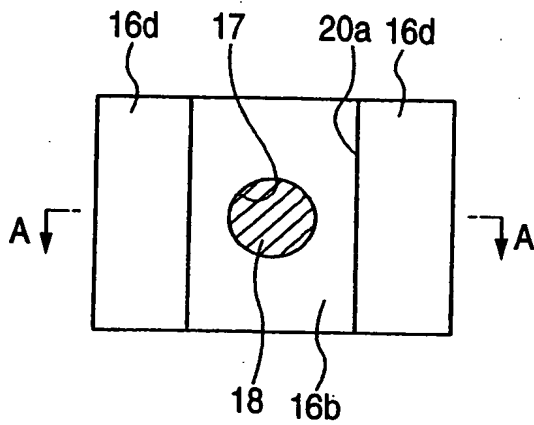


FIG. 72 (b)

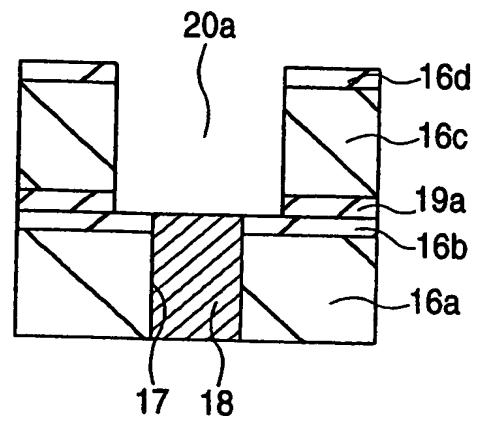


FIG. 73 (a)

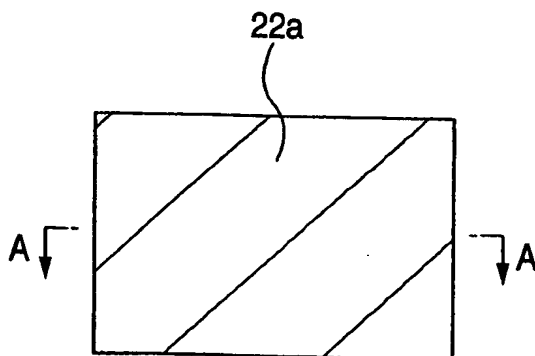


FIG. 73 (b)

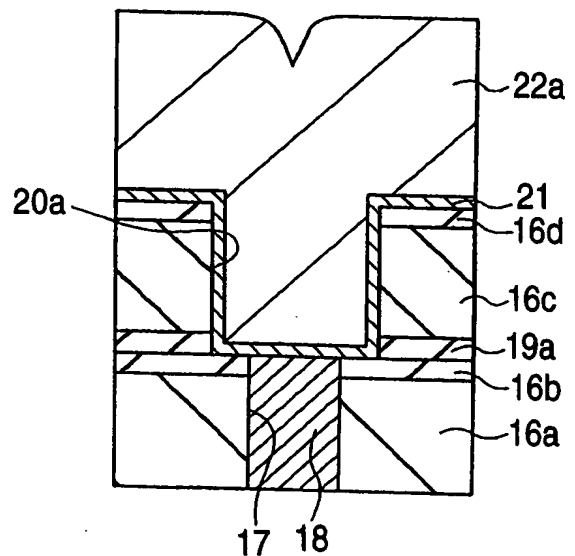




FIG. 74 (a)

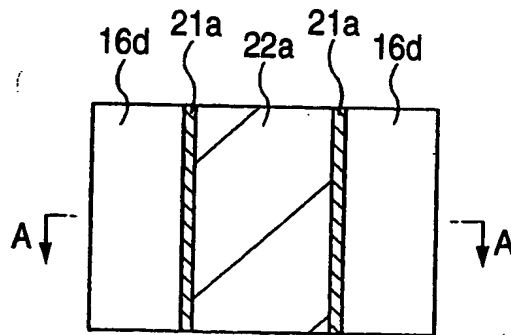


FIG. 74 (b)

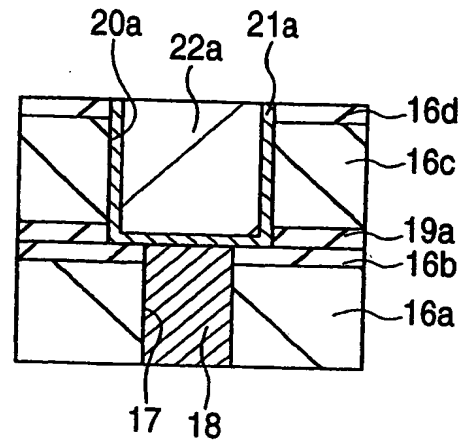


FIG. 75 (a)

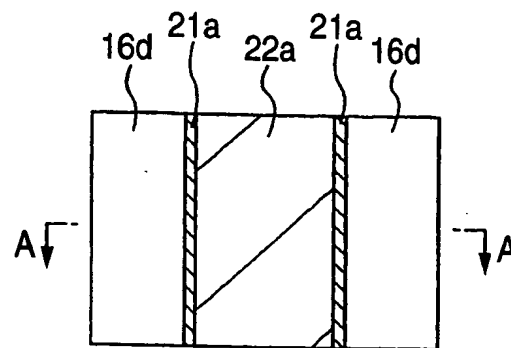


FIG. 75 (b)

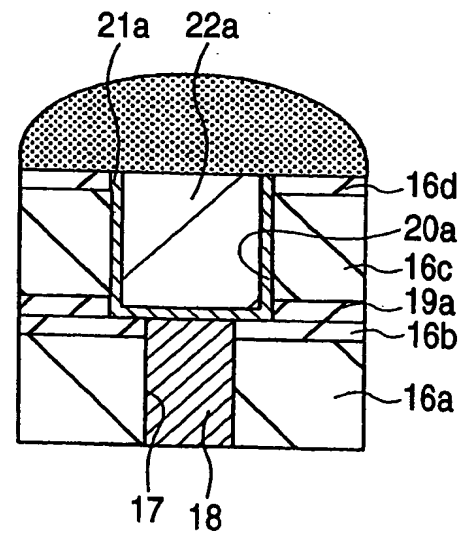


FIG. 76 (a)

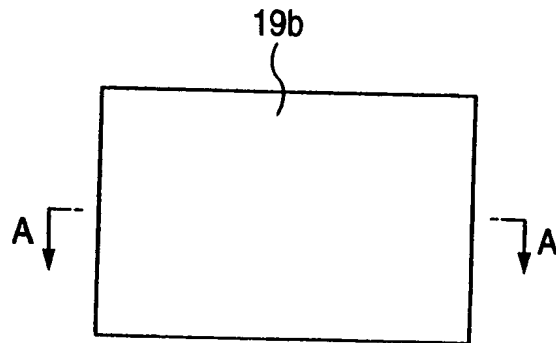


FIG. 76 (b)

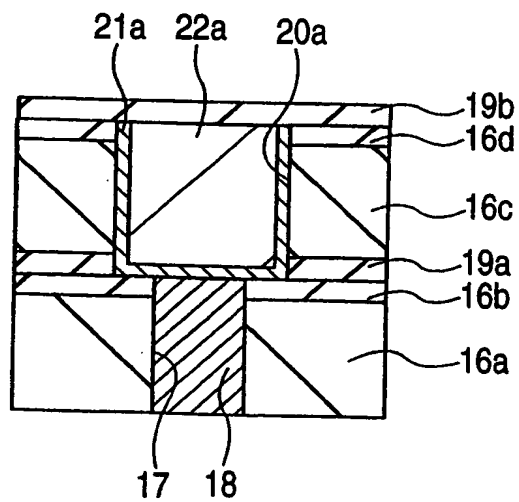


FIG. 77 (a)

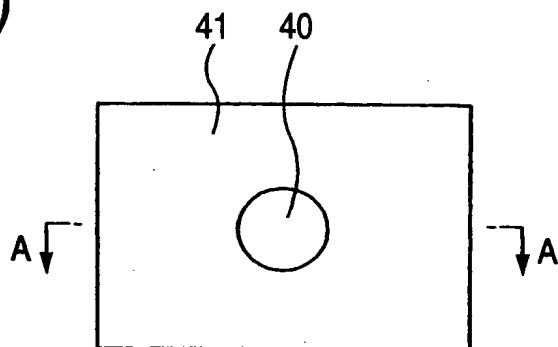


FIG. 77 (b)

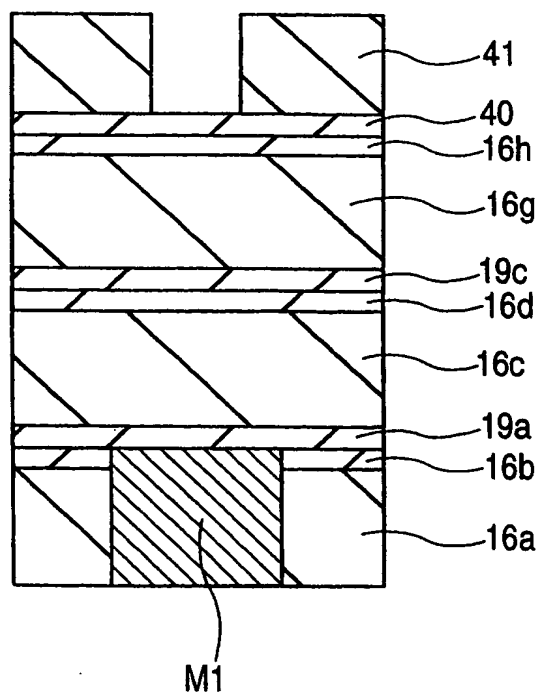


FIG. 78 (a)

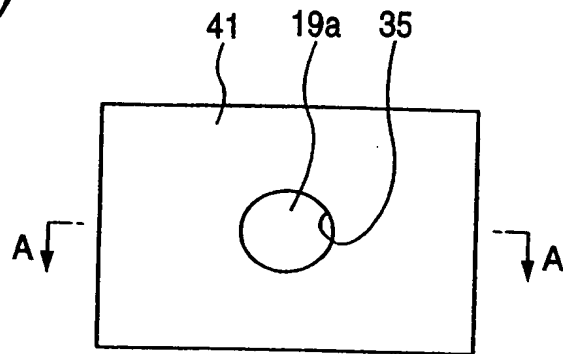
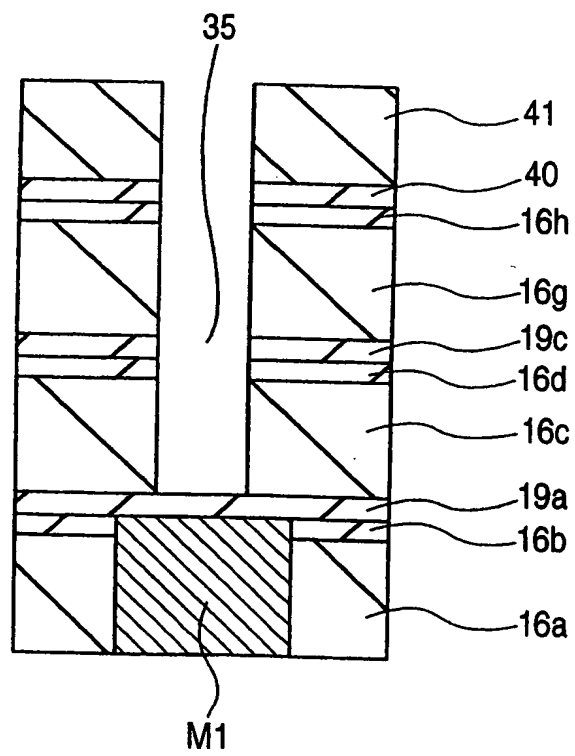
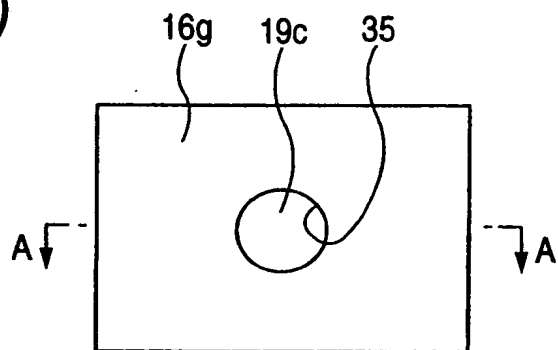
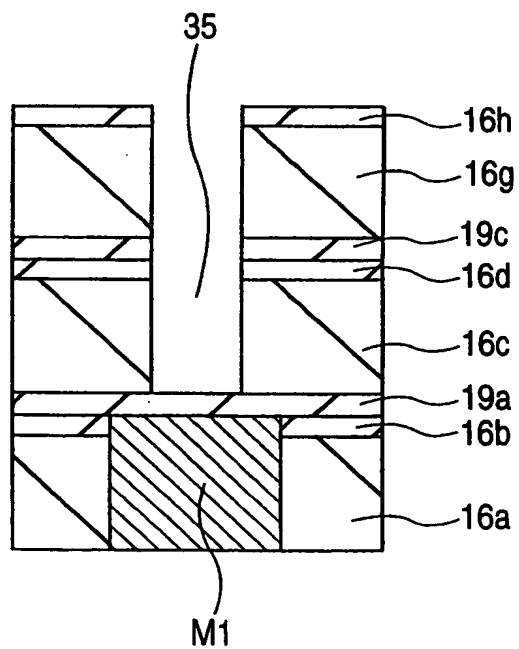
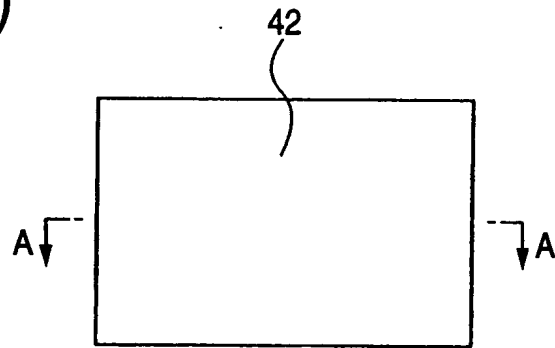


FIG. 78 (b)

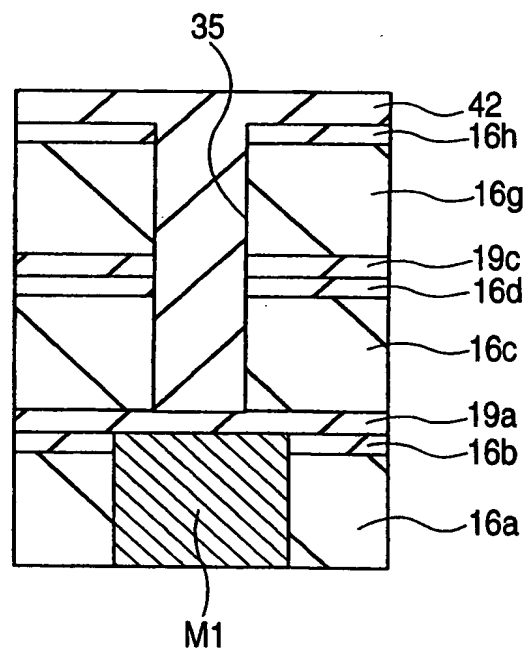


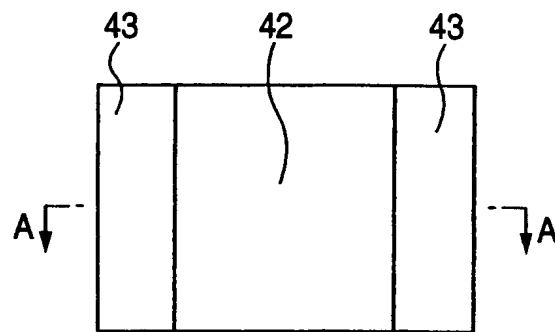
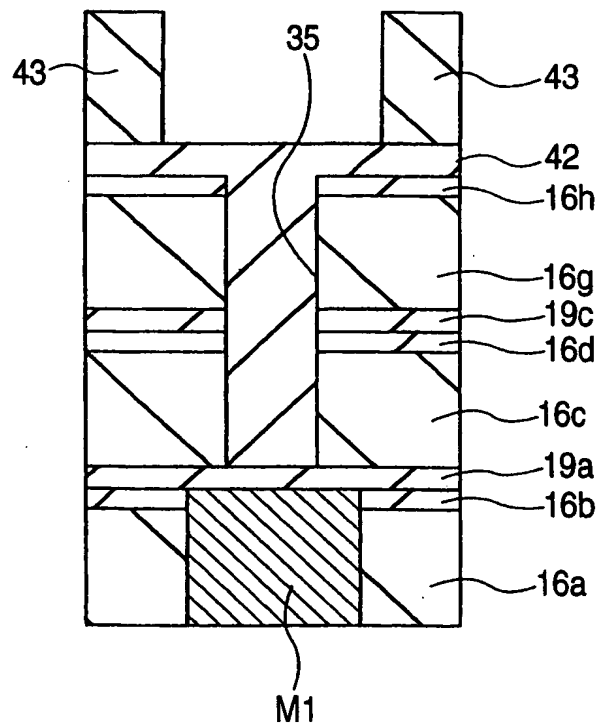
*FIG. 79 (a)**FIG. 79 (b)*

**FIG. 80 (a)**

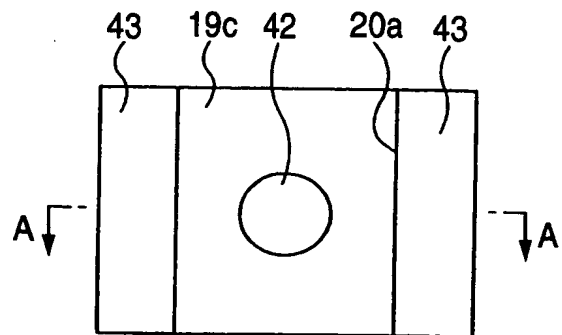


**FIG. 80 (b)**

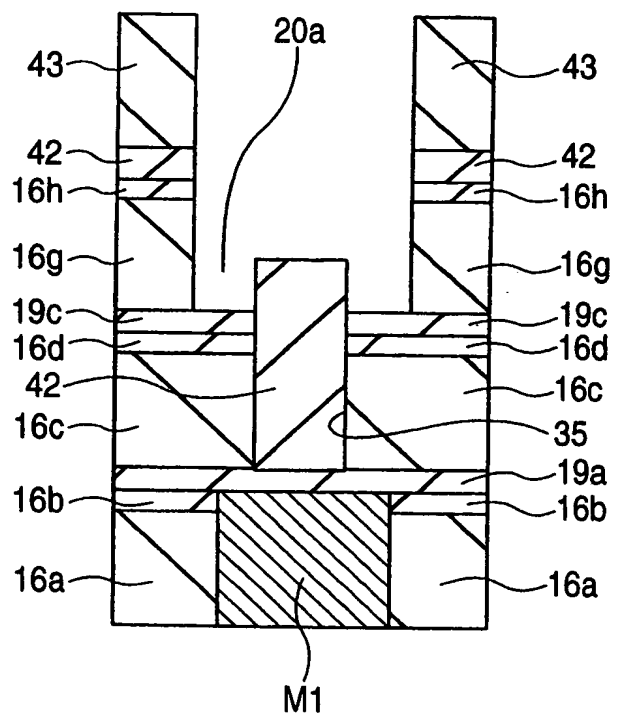


*FIG. 81 (a)**FIG. 81 (b)*

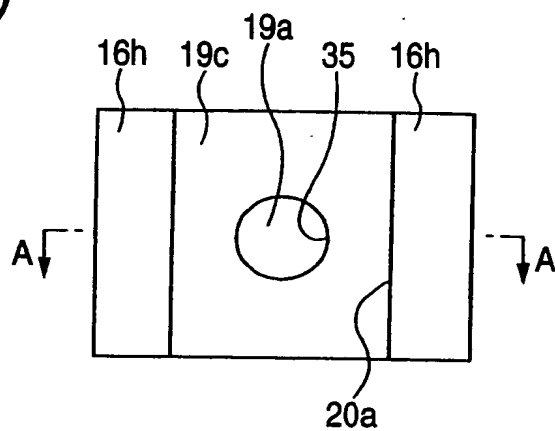
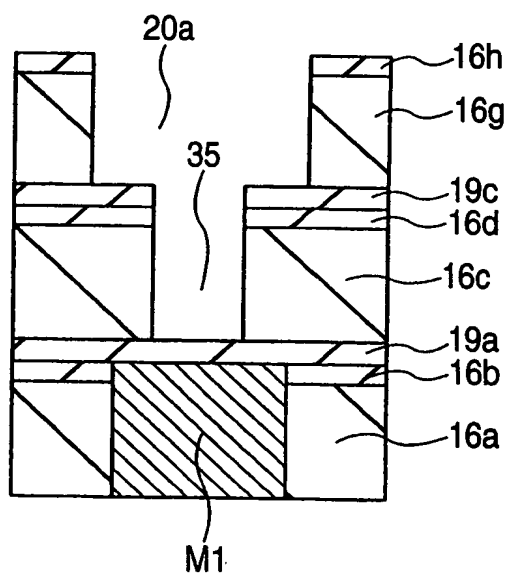
**FIG. 82 (a)**

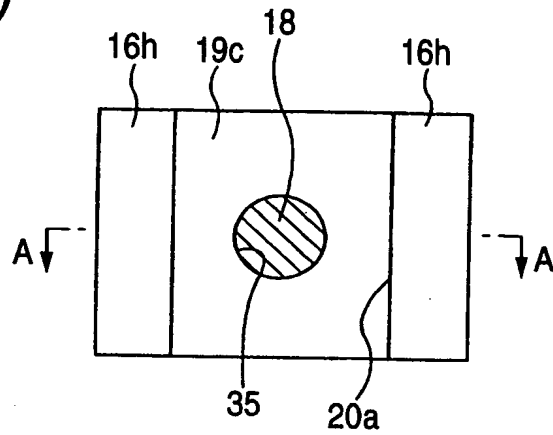
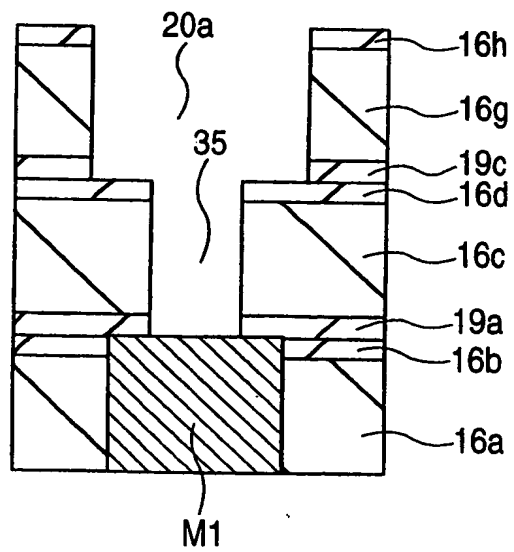


**FIG. 82 (b)**





**FIG. 83 (a)****FIG. 83 (b)**

**FIG. 84 (a)****FIG. 84 (b)**

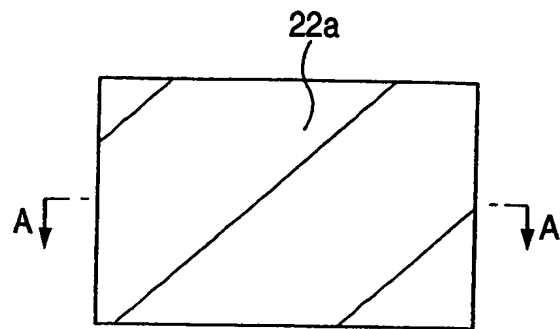
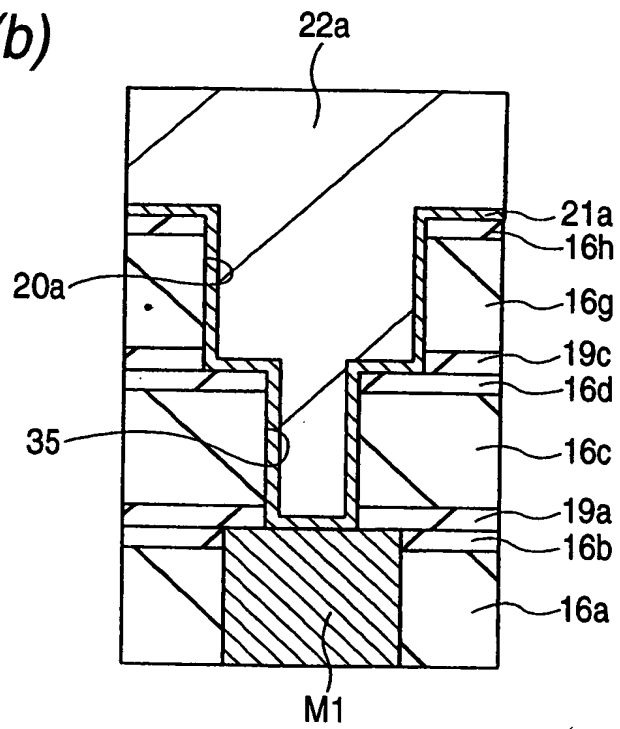
**FIG. 85 (a)****FIG. 85 (b)**

FIG. 86 (a)

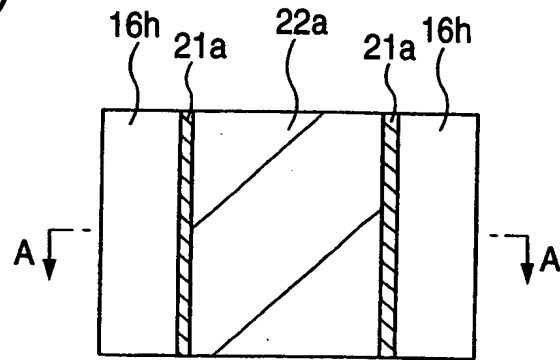


FIG. 86 (b)

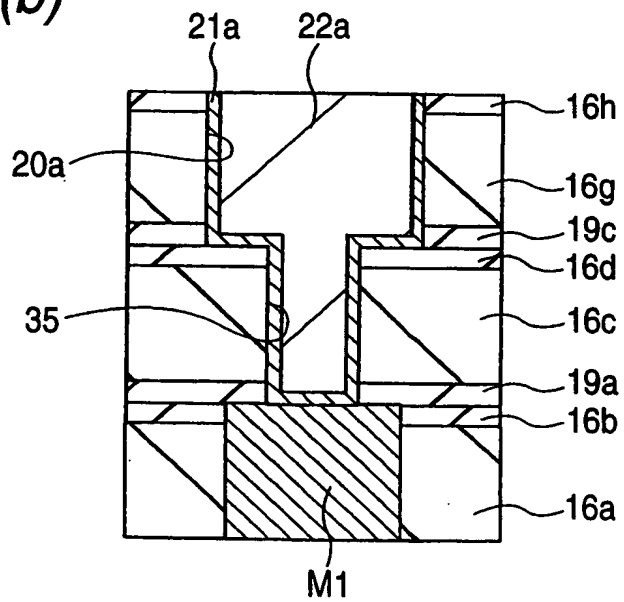


FIG. 87 (a)

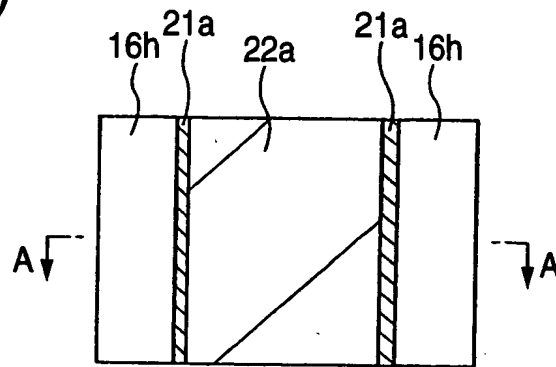


FIG. 87 (b)

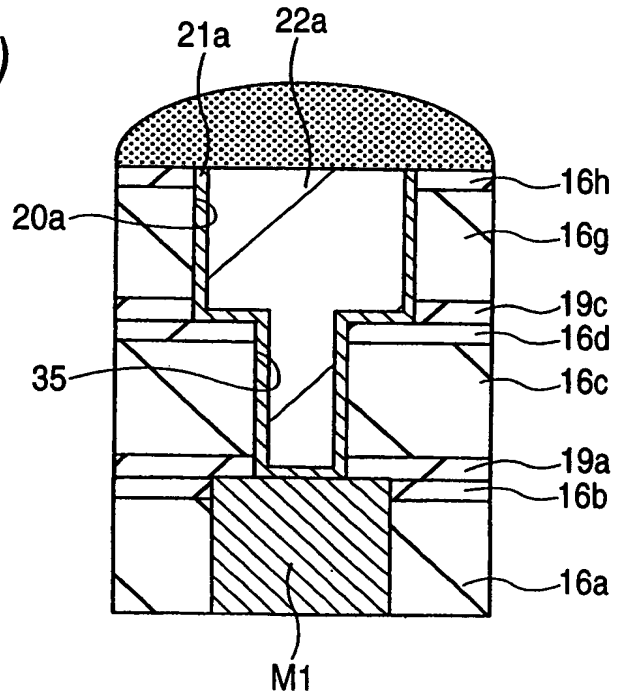


FIG. 88 (a)

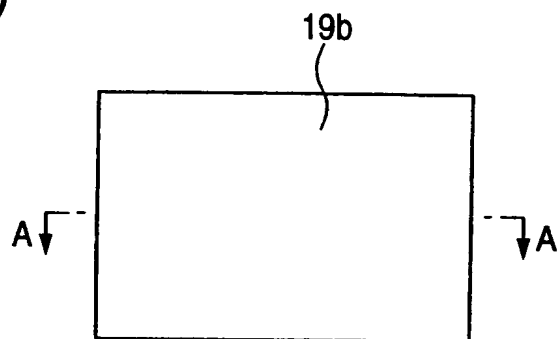
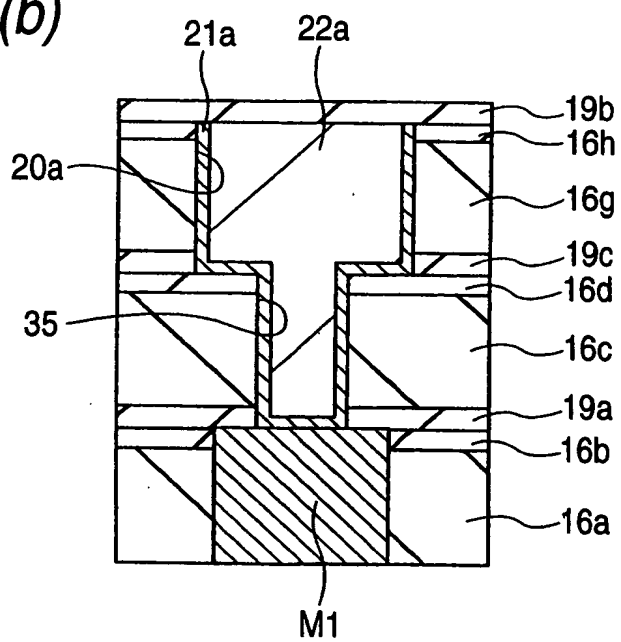
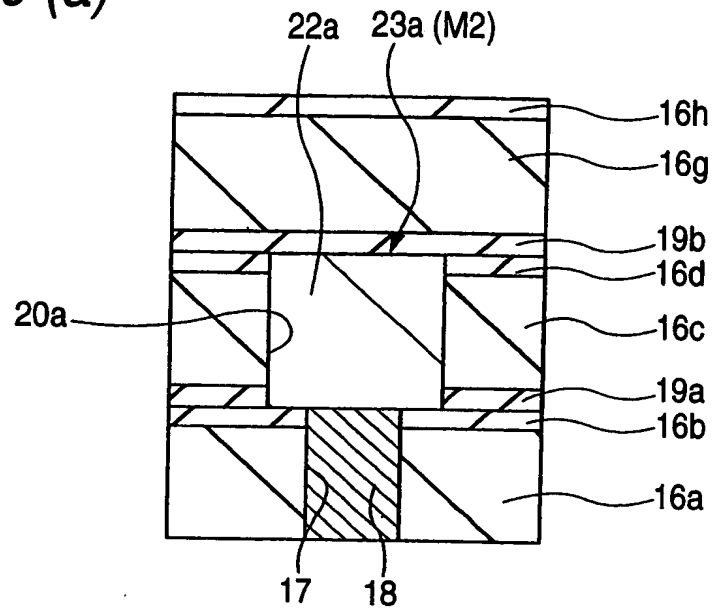


FIG. 88 (b)



**FIG. 89 (a)****FIG. 89 (b)**